

CHEMICAL ABSTRACTS

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I--APPARATUS

C. G. DERICK

A furnace for the determination of moisture in dry carbon-dioxide-free air. J. A. MONTGOMERY. *Chem. Met. Eng.* 23, 937-8(1920).—A piece of 6-in. iron pipe 8 in. long is screwed at the bottom into a cap carrying elec. terminals and air inlet. The iron cover, which slips on, is recessed to afford approx. air-tightness; an Hg-filled thermometer well passes through its center. A central sleeve, fitting over the thermometer well, carries 2 perforated shelves for supporting crucibles, and the lower of the shelves rests upon lugs screwed into the pipe. Dry CO₂-free air is passed into the bottom of the furnace, up through the nichrome resistance coils and the crucibles containing samples, and leaves through a cock near the top. A temp. of 250° may be maintained, with a 5° regulation. W. B. V.

An apparatus for determining small amounts of carbon dioxide. R. C. WRIGHT. *Am. J. Botany* 7, 368-70(1920).—The CO₂ app. described consists of a glass bulb with stem of about 150 cc. capacity, having a stopcock at the top of the bulb at intake, and a funnel above. The glass graduated stem extending from bottom of bulb has a two-way stopcock at the bottom. A balance rubber tube is attached. The app. is filled with air to be analyzed, and NaOH is introduced to absorb the CO₂, which is replaced by H₂O entering from the balance tube. The height of the column of H₂O in the graduated glass stem gives directly in % the amt. of CO₂ removed from the sample of air. A description of the method of operating the CO₂ app. is given. The method was used in the analysis of air in cold-storage plants. J. J. SKINNER

Laboratory apparatus for preparing electrolytic hydrogen. WM. GEORGE PALMER. Univ. Cambridge. *J. Soc. Chem. Ind.* 39, 316r(1920).—A cylindrical sheet of Ni as cathode is supported in an inverted unglazed earthenware pot by leads passing through sealed glass tubes cemented through holes bored in the closed end. The lower part of the pot is bored full of small holes and wrapped with parchment paper, while the upper part is impregnated with paraffin so as to be gas-tight. Another sheet of Ni of cylindrical form is passivated by the action of concd. HNO₃ for use as the anode, and surrounds the pot at a distance of about 1/8 inch. The combination is immersed in a beaker containing 5-10% KOH soln. A rubber stopper passing through a hole in the top of the pot carries the H₂ delivery tube. In a cell with pot about 3 × 7 in. a current of 8-10 amps. may be used without anode deterioration. W. B. V.

Simple changes which effect a marked improvement in the Schreiner colorimeter. C. W. DAVIS. *J. Franklin Inst.* 190, 243-4(1920).—The Schreiner colorimeter is reconstructed so that but one circle is formed, of which the right half is the image of one-half the bottom of the right inside tube, and the left half is the image of one-half the bottom of the left inside tube. The app. gives more satisfactory service and eliminates eye strain. For details of construction, reference must be made to the original paper. JOSEPH S. HEPBURN

The production and measurement of high vacua. V. [Gauges.] SAUL DUSHMAN. *Gen. Elec. Rev.* 23, 847-55(1920); cf. *C. A.* 14, 3548.—The present installment deals with the Knudsen, Pirani-Hale and ionization gages. Profusely illustrd. C. G. F.

Water heater for vessels with pipe outlets. ANON. *Elec. Rev.* 77, 862(1920).—A simple heater consists of Ni-Cr wire covered with mica and inclosed in Cu casings which slip into closely fitting Cu sheaths, mounted on a brass header with a drawn steel terminal cover. The size and number of units depend upon the rating. The header and cover are Ni-plated. Any unit can be renewed without replacing the others. The heater is inserted through the walls of the vessel below the minimum water level or it may be converted into a circulation type heater. The capacities are 500-4500 watts on standard commercial voltages. The larger sizes have three heats, controlled by a switch. Applications include hot-water tanks, glue cookers and paste kettles, sterilizers, stills and some lab. app.

W. H. BOYNTON

Sliding-contact tube rheostat. ANON. *Elec. Rev.* 77, 901(1920).—Brief description of resistance units made with a total resistance of from 0.4 to 6000 ohms, the low-resistance units having a current-carrying capacity of 0.2 ampere. These current ratings correspond to a temp. rise of 200° when in continuous service.

C. G. F.

Device for measuring the internal diameter of glass tubing (STORR) 19.

Apparatus for determining density. L. UBBELOHDE. *Brit.* 148,575, July 10, 1920. An app. for continuously indicating the sp. gr. of gases comprizes a pair of meters, connected through nozzles to a suction device comprizing a sealed liquid-containing vessel into which passes a pipe open to the air. Reduction of pressure at the surface of the liquid is produced by suction on the pipe and, owing to the reduced pressure, the gas under test is drawn through the meter while a standard gas such as air is drawn through the meter. The sp. gr. of the gas under test is deduced from the difference between the vols. passing through the meters, which is indicated by a pointer carried by a differential gear operated by the meters.

Filtering air and gases. DEUTSCHE LUFTFILTER-BAU-GES. *Brit.* 148,546, July 10, 1920. A filter is composed of standard interchangeable elements, each of which can be removed for cleaning purposes, and is meantime replaced by another. Flaps are arranged to close the openings left by the removal of the elements.

Filter for gasoline or other liquids. W. A. DANIEL. U. S. 1,357,618, Nov. 2.

2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON

Priestley air pump. COLEMAN SELLERS, JR. AND HORACE W. SELLERS. *J. Franklin Inst.* 190, 877-80(1920).—Address presenting Priestley's air pump to the Franklin Inst. An account is given of Priestley's life and chem. discoveries, and of the history of his air pump.

JOSEPH S. HEPBURN

Harmon Northrup Morse. IRA REMSEN. *Science* 52, 497-500(1920).—An obituary.

E. J. C.

A study of the economic status of chemists in the government service, ten educational institutions and thirty-seven firms. LYMAN F. KEBLER. *J. Ind. Eng. Chem.* 12, 1206-13(1920).

E. J. C.

Recent advances in science—physical chemistry. W. E. GARNER. *Univ. London. Sci. Progress* 15, 188-91(1920).—Review of recent work on the reaction limits of mixed crystals, isotopes of Cl, tri-atomic H, and the specific heats of gases by the explosion method.

JOSEPH S. HEPBURN

The mechanics of solidity. J. INNES. *Nature* 106, 377(1920).—The mean linear expansion and hardness of 45 substances, including a number of minerals, are compared, indicating a close relationship between these properties.

S. G. GORDON

The cry of the research worker. A. G. CHURCH. *Electrician* 85, 662(1920).—
Polemical. C. G. F.

The chemistry of France and the problems of war. C. MOUREU. *Bull. sci. pharmacol.* 27, 513-7(1920).—A brief review of the role and work of the ministry of chem. and pharmaceutical products during the war. F. S. HAMMETT

A revision of the atomic weight of aluminium. THEO. W. RICHARDS AND HENRY KREPELKA. *J. Am. Chem. Soc.* 42, 2221-32(1920).—The synthesis and analysis of pure $AlBr_3$ is described. It was digested 3 times in N_2 and distd. twice in N_2 and twice *in vacuo*. The value for the at. wt. of Al was found to be 26.963, taking Ag as 107.88. E. H. DARBY

Revision of the atomic weight of bismuth. O. HÖNIGSCHMID. Munich. *Z. Elektrochem.* 26, 493-8(1920).—The samples of metallic Bi employed for the at. wt. detns. were obtained from the following sources: (1) commercial $Bi(NO_3)_3$, which was first purified, (2) pure $Bi(OH)_3NO_3$ (Kahlbaum), (3) "purest" Bi (Kahlbaum), (4) the so-called Bi fractions of the U and Ra industry, (5) $BiCl_3$. The at. wt. of Bi was obtained by detg. the ratio $BiCl_3:3AgCl$. The results of 32 analyses gave for the at. wt. of Bi the value 209.015 with a mean deviation from the mean of ± 0.01 . This value, which is a unit higher than the international at. wt. of Bi (208.0), agrees approx. with that detd. by Classen (208.92, cf. *Ber.* 23, 938). Analyses of $BiBr_3$ gave for the at. wt. of Bi the value 209.03. H. JERMAIN CREIGHTON

A new periodic relation between the atomic weights of the elements. III. A resonance theory of chemical combination. K. FEHRLI. *Physik. Z.* 21, 552-4(1920); cf. *C. A.* 14, 3174-5.—With his former assumption of the atom as units on the surface of a sphere, F. obtains for the angular velocity of rotation of any atom

$$\Omega_n = \frac{1}{\sqrt{R_n}} \sqrt{\frac{e^2 \Sigma N_n}{m}}$$

where N is the no. of units on the at. surface and R_n is the radius

of the atom of at. no. n , given by $R_n = \sqrt{\frac{\Sigma N_n}{4\pi k}}$ (*C. A.* 14, 3174). Calcg. values

for $10^{-10}/2.9 \Sigma_n$, F. finds that the noble gases have the very simple relation between their vibration nos. of $1/2, 1/3, 1/4, 1/5, 1/6, 1/7$ so that their resonance cannot be improved by chem. combination. Other elements, by combination, have their vibration component altered so that it is more in tune with the vibration of the mol. The valence of an element is a function of the no. of energy quanta which it must take up to be resonant with the nearest noble gas. Thus C, which is equally near two noble gases, can go either way, as in CH_4 or CCl_4 . Contravalence is thus explained. IV. The relation between the magnetic susceptibility and the difference between the theoretical and experimental atomic weights of the elements. *Ibid* 554-5.—The course of the curve of at. magnetic susceptibility, showing the well known periodic relationships, follows the course of the curve of the difference between the theoretical and the exptl. at. wts. of the elements. A theory of dia- and paramagnetism is given on the basis of atomic resonance considerations (*Physik. Z.* 21, 552-4(1916)).

A. E. STEARN

The periodic system of the elements and the mechanical-technologic properties of alloys. W. GUERTLER. *Z. tech. Physik* 1, 176-81(1920).—Until recent years it has been impossible to predict the effect of the addition of one metal to another or to an alloy. The data now available make it possible to arrange the metals in groups and to tell with some certainty the effect of mixing metals of given groups. The principal properties considered are the strength and ductility. Complete tables and diagrams are given. E. D. WILLIAMSON

Properties of fluids in the neighborhood of the critical point and the characteristic equations. C. BRUHAT. *Compt. rend.* 170, 1173-5(1920).—By expanding the equation of state $p = f(V, T)$ for gas and liquid into a Taylor series, mathematical conditions are found for a general equation expressing the continuity of the liquid and gas state. It is shown that the values at the crit. point of dp/dT , d^2p/dT^2 , and α (the slope of the rect. diameter) give the best tests of the correctness of an empirical equation of state. These values for normal liquids are about 7, 30 and values varying from 0.2 to 1.0 resp. Those calcd. from equation of van der Waals are 4, 9.6 and 0.4. The Clausius equation assuming $T = T^{-1}$ are 7, 32 and $8(1 - \beta)(0.1 + \beta)$. F. R. B.

The equation for the chemical equilibrium of homogeneous mixtures. ALFRED W. PORTER. *Trans. Faraday Soc.* 15, 75-82(1920).—By a modification of the usual method employing the "equilibrium box," P. obtains the known rigorous equations for chem. equil. of homogeneous mixts. Special cases are worked out for mixts. of incompressible fluids, mixts. of perfect gases, mixts. of gases obeying the equations of Hirm or van der Waals. [The functions g and y defined for the last cases are proportional to the activity. Cf. C. A. 7, 1657. ABST.] F. R. B.

Correspondence of substances in the solid state. FELIX MICHAUD. *Compt. rend.* 171, 241-3(1920).—The use of the critical temp. as a unit of measurement to det. the corresponding states of substances usually fails in the case of solids. If, instead, the temp. is chosen for each substance for which C/T is a max. (C = specific heat; C/T is 0 at 0° and ∞°) and the substances are compared at temps. which are for each the same multiple or submultiple of this special critical temp., the curves for the sp. heat will, if superposed, coincide to 9% or better. But the author tries only elementary substances, and only 5 of these, all metals. W. P. WHITE

The calculation of the number of independent components in a system. LOUIS DUBREUIL. *Bull. soc. chim.* 27, 809-13(1920); *Compt. rend.* 171, 720-1(1920).—The compns. of all the substances present are written in the form of a rectangular array and all the possible determinants are formed. The number of independent constituents is the same as the order of the highest determinant which does not vanish.

E. D. WILLIAMSON

The relation between the molecular volume, the energy of separation of ions, and the heat of sublimation of the alkali halides and the hydrogen halides. A. REIS. Karlsruhe. *Z. Elektrochem.* 26, 408-12(1920).—Comparison of the mol. vols. of the halides of K, Na, Li and H shows that while the mol. vols. of the compds. formed by a given halogen with different alkali metals decreases as the at. number of the positive atom decreases, the mol. vols. of the hydrogen halides do not conform to this regularity. The energies of sepn. of ions in the case of the hydrogen halides are twice as large as those of the alkali halides. It follows that energies of the sepn. of the ions of the latter must be double that of those of the former compds., and that the mol. vols. of the hydrogen halides must have very much smaller values than those of the alkali halides, provided that the lattice structure of the 2 types of compds. is the same. To account for the fact that the actual mol. vols. of the cryst. hydrogen halides are approx. equal to the mol. vols. of the Na halides, it is concluded that in the lattice of the hydrogen halides the distances between neighboring ions are alternately larger and smaller. Since sublimation may be regarded as the resolution of a dipolar lattice into single dipoles, it is evident that through a decrease in the intramol. ionic sepn. there must occur a simultaneous increase in the heat of sublimation. The difference in behavior of the alkali halides and the hydrogen halides with respect to this conclusion affords support for the lattice structure suggested above. In conclusion, deformation of the at., and the elec. moment of the mol. are discussed. H. JERMAIN CREIGHTON

The chemical interpretation of the crystal lattice. A. REIS. Karlsruhe. *Z. Elektrochem.* 26, 412-20(1920).—The procedure for discovering the "natural at. groups"

in the crystal lattice is discussed. It is pointed out that in order for atoms to associate to form "natural groups" the following requirements must be fulfilled: (1) 2 at. bonding distances (Verbindungsstrecken), of which one lies in the interior of an at. group and the other lies between 2 at. groups, may never be crystallographically equiv.; (2) the weakest of the bonds that are indispensable for the inner cohesion of the "natural at. groups" must be stronger than the strongest bond between 2 at. groups; (3) the magnitude of "natural at. groups" cannot be larger than the 2 above requirements permit. "Natural at. groups" may be defined as those which satisfy these 3 requirements; and for every conceivable at. lattice this definition is univocal. It is shown that each atom in a lattice may be surrounded by an imaginary cell by bisecting each bonding distance between the atom and every adjacent atom by a perpendicular plane. Crystallographically equiv. atoms correspond to equiv. cells and *vice versa*, crystallographically equiv. bonding distances correspond to equiv. cell walls. Those cells which result from the removal of certain cell walls (according to definite rules) contain "natural at. groups." In the case of a cryst. binary chem. compd., cells containing "natural at. groups" are formed by removing those cell walls which correspond to the shortest bonding distance between an atom and adjacent atoms. If the crystal lattice of a chem. individual consists of dissimilar polyat. groups, these groups are termed radicals—not mols. The stoichiometric compn. of a substance containing such radicals can only be expressed by the summation of these radicals. Of the radicals and single atoms of such a lattice, at least 2 are electrically charged; in reality the radical lattices are radical ions and can belong only to salts. Lattices formed by dissimilar monatomic groups belong, in the overwhelming majority of cases, to heteropolar chem. compds. and are in these instances at-ion lattices, *i. e.*, all atoms carry elec. charges. With a few exceptions, the following simple classification of crystal lattices holds:

	Polyatomic Groups	Monatomic Groups
Similar at. groups,	mol. lattices	monatomic lattices
Dissimilar at. groups,	radical-ion lattices	at-ion lattices

All strong intramol. unions correspond to atomic distances of 1–2 Å, while in the solid state of aggregation the intermol. at. distances are considerably greater (2.5–4 Å). The following topics are treated briefly: cohesion and thermal properties of solids; polymorphism; conclusions for the doctrine of chem. constitution. In conclusion, the properties of the lattice types are surveyed.

H. JERMAIN CREIGHTON

The interior friction of quartz filaments at high temperatures. C.-F. GUYE and A. MOREIN. Geneva. *Arch. sci. phys. nat.* 2, 351–71 (1920).—Filaments of quartz and glass appear to fall in a class by themselves in their behavior toward torsional friction. Interior structure is greatly changed by annealing, a fact discovered during the exptl. work performed, and one which seriously detracts from the value of the data obtained. Measurements were made at intervals between 18° and 325°. For similar measurements at low temps., cf. Guye and Einhorn-Bodzechowski, *C. A.* 10, 2061, 2431.

J. T. R. ANDREWS

The influence of hydrogen sulfide on the occlusion of hydrogen by palladium. (II.) E. B. MAXTED. *J. Chem. Soc.* 117, 1280–8 (1920); cf. *C. A.* 14, 10.—The object was to follow quantitatively the inhibitive effect of successive increments in H₂S content of a given wt. of Pd. The poisoning curve for undecompd. occluded H₂S as it affects the H by Pd was found to be linear in form. Evidence was obtained of the gradual and occlusion spontaneous dissociation of the occluded H₂S even at ordinary temp., with the formation of H and PdS and an accompanying and corresponding change in the occlusive power. This is shown by the different forms of the absorption curves which give the same final vol. of H occluded, but show intermediate variation with the time allowed to elapse between treatment with H₂S and subsequent measurement of the occlusive power for H, almost complete suppression of the slow process of secondary occlusion

having been induced by allowing the system to stand. As expected the catalytic activity of Pd necessary for causing dissociation of H_2S decreases progressively as poisoning proceeds, so that the rate of absorption of fresh H_2S and the speed of dissociation rapidly diminish with the S content of Pd.

G. L. CLARK

Measurement of surface tension. WILLIAM N. RAH AND JOSEPH REILLY. *Sci. Progress* 15, 223-33(1920).—A detailed account is given of the capillary rise and the drop wt. methods. Mention is also made of the air bubble method of Jager.

JOSEPH S. HEPBURN

Dilation and compressibility of liquid carbonic acid. C. F. JENKIN. Oxford Univ. *Proc. Roy. Soc. (London)* 98A, 170-82(1920).—The object of these measurements was to obtain data for plotting $\theta\phi$ and $I\phi$ diagrams for CO_2 . Detns. of P , V , and T were made at intervals of 5° from -37° to $+30^\circ$. The observed vols. were then reduced, in the ratio of the observed vol. at 0° on the limit curve, to Behn's sp. vol., and replotted. From these curves the sp. vols. at each even hundred lbs. pressure were plotted against temps. The slopes of each set of curves enabled the true compressibility, $1/v(dv/dp)_t$, and temp. coeffs., $1/v(dv/dt)_p$, to be calcd. Data are presented in 3 tables and 4 figs.

J. T. R. ANDREWS

The Clausius vaporization formula and the comparison of the vapor pressure curves of two substances. A. HENGLEIN. Danzig. *Z. Elektrochem.* 26, 431-6(1920).—The phys. meaning of the consts. contained in the Ramsay-Young and the Dühring rules is made clear by deriving these rules from the Clausius vaporization formula. The Dühring rule is a special case of the general expression: $k(T_1\theta_1/T_2\theta_2) = (T_1 - \theta_1)/(T_2 - \theta_2)$, where T_1 and θ_1 are the b. ps. of a substance at 2 different pressures, and T_2 and θ_2 the b. ps. of a reference substance (H_2O) at the same pressures. The const. k is approx. equal to the ratio of the mol. heats of vaporization of the 2 substances. The following formula, which holds up to the critical point, has been derived from the Clausius equation: $\log T_1 = a \log T_2 + b$, where T_1 and T_2 are the temps. of 2 substances at the same pressure. Since this equation gives straight lines in the logarithmic coördinate system, the vapor pressure curve of any substance may be readily obtained from that of H_2O .

H. JERMAIN CREIGHTON

A method of measuring low vapor pressures with its application to the case of trinitrotoluene. ALAN W. C. MENZIES. *J. Am. Chem. Soc.* 42, 2218-21(1920).—By the use of a McLeod gage immersed in a water bath, filled with an inert gas, such as N and connected with a bulb containing the material under examn., the vapor pressure of this substance can be detd. The vapor pressure of trinitrotoluene was measured by this means at temps. from 82° to 102° giving values from 0.042 to 0.116 mm. These results were checked by the gas satn. method.

E. H. DARBY

Calculation of vapor densities. REGINALD G. DURRANT. *Nature* 105, 742(1920).—By evaluating the const. R in the gas equation $pv = RT$, using mm. of Hg column as units of pressure p , and taking v as the g.-mol. in liters, which on the O standard at normal temp. and pressure is 22.4 l., there is obtained the value 62.36. The d of a gas may then be readily calcd. by using this value in the equation $d = mRT/2pv$, where m is the mass in g. and v is in liters.

W. H. ROSS

Molecular volumes of alkali halides. K. FAJANS AND H. GRIMM. *Z. Physik* 2, 299-308(1920).—A relation of the form $y = \alpha x + a$ is shown to connect y , the mol. vol. of a halide of a given alkali metal, with x , the mol. vol. of the same halide of some other alkali metal. Thus $V_{Kx} = 1.130 V_{Na x} + 6.95$, where x is any halide. Values of α and a are computed from Baxter's exact density values for Li, Na, K, and Rb salts of Cl, Br, and I. The consts. thus obtained may be used to compute the mol. vols. of other halides that are unknown or imperfectly known. The relations hold to about 0.1%, but the Cs salts are abnormal. The mean of a and a/α is supposed to represent the difference of the actual vols. of the ions for zero value of the volume of the other

constituent. The data show the sphere of action of an ion depends on the other constituent.

F. C. HOYT.

The distillation of a ternary mixture, one constituent of which is not volatile. P. PASCAL. *Bull. soc. chim.* 27, 814-20(1920).—The case of a mixt. of HNO_3 and H_2SO_4 is treated at length. Triangular diagrams are given showing the compn. of liquid and vapor at all points, the method of tracing the curve of distn. of any mixt., the locus of the points of max. nitric compn. of vapor or liquid, and one or two other similar loci.

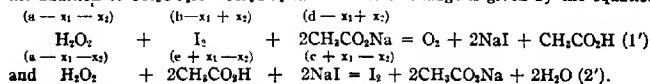
E. D. WILLIAMSON

Reduction kinetics of the azo compounds. HEINRICH GOLDSCHMIDT AND ASBJÖRN BRAANAAS. Univ. Christiania. *Z. physik. Chem.* 96, 180-213(1920).—The reduction of 19 azo compds. with SnCl_2 and HCl and of 6 with SnBr_2 and HBr has been studied at 25° . It has been found that in all the reactions the reduction is bimol. In those reactions in which the azo compd. is split into 2 amino compds. by taking up 4 atoms of H, it must be assumed that the reaction takes place in 2 stages. In the 1st stage reduction to a hydrazo compd. takes place at a finite velocity; this is followed by a further reduction of the hydrazo compd. at an immeasurably fast velocity. Like the reduction of nitro compds., the reduction of azo compds. is due to the presence of a small concn. of SnCl_2^- ions in the acid Sn soln., although the SnCl_2 itself can effect reduction. Indeed, both of these actions may occur simultaneously. The reduction of α -naphtholazobenzenesulfonic acid is effected by the SnCl_2^- alone, while, for example, that of benzeneazo- β -naphtholsulfonic acid is due to the combined actions. Since when reduction is due to SnCl_2^- the velocity const. is $k = K[\text{Cl}^-]$, and when it is the result of the combined actions $k = K_1 + K_2[\text{Cl}^-]$, the HCl may be largely replaced by a metal chloride without any change in the velocity of reduction taking place. In many cases it is not the azo compd. as such that is reduced, but a compd. formed in small concns. by it with the acid. When this addition product reacts with the SnCl_2^- , the velocity const. is given by the expression: $k = K[\text{H}^+][\text{Cl}^-]^2$, which becomes $k = K[\text{H}^+]^2[\text{Cl}^-]^2$ in the absence of a metal chloride. From these formulas it is evident that when an addition compd. is formed, the velocity of reduction is increased by the presence of a metal chloride. Instances have been observed, e. g., with $\text{C}_6\text{H}_5\text{N}_2\text{C}_6\text{H}_4\text{OH}$, where reduction proceeds in accordance with the equation: $k = K_1[\text{Cl}^-] + K_2[\text{H}^+][\text{Cl}^-]^2$. This is explained on the assumption that both the azo compd. and its addition compd. with the acid react with the SnCl_2^- . It has been found that SnCl_2 may react with the addition compd. formed by the azo compd. with HCl , the reaction taking place in accordance with the equation: $k = K[\text{H}^+][\text{Cl}^-]$. This equation becomes $k = K_1[\text{H}^+][\text{Cl}^-] + K_2[\text{H}^+][\text{Cl}^-]^2$ when there is also a reaction with the SnCl_2^- ions. The reduction of azo compds. is more rapid with SnBr_2 and HBr than with SnCl_2 and HCl , the ratio of the 2 velocities varying considerably with different azo compds. Apparently, however, the substitution of Cl by Br does not alter the character of the course of the reaction. Finally, the results of the investigation show that the catalytic action of the halogen and H ions does not seem to depend on the degree of dissociation of the strong electrolytes employed, but that it is proportional to their total concn.

H. J. C.

Kinetics of the hydrogen peroxide-iodine reaction. E. ABEL. *Z. physik. Chem.* 96, 1-179(1920).—The reaction between H_2O_2 and I, the stoichiometric course of which has been found to correspond to the empirical equation: $\text{H}_2\text{O}_2 + \text{I}_2 = 2\text{HI} + \text{O}_2$ (1), is always accompanied by the reaction $\text{H}_2\text{O}_2 + 2\text{HI} = \text{I}_2 + 2\text{H}_2\text{O}$ (2). This results in a somewhat cloudy reaction picture, the clarification of which is rendered difficult owing to the fact that under otherwise suitable conditions reaction (1) proceeds with a kinetic tangible velocity only within a narrow H-ion interval (of the order of magnitude $[\text{H}^+] = 10^{-6}$ to 10^{-7}). In the present investigation the reaction between H_2O_2 and I was followed by measuring the O evolved, supersatn. of the large vol. of reaction

liquid being prevented by rapid stirring. Favorable H-ion concns. were attained by the addition of $\text{CH}_3\text{CO}_2\text{H}-\text{CH}_3\text{CO}_2\text{Na}$. The total change is given by the equations:



In these equations the parenthetical expressions represent the concns. at the time t of the substances over which they are placed, a, b, c, d and e representing the initial concn. of H_2O_2 , I , KI , $\text{CH}_3\text{CO}_2\text{Na}$ and $\text{CH}_3\text{CO}_2\text{H}$, resp., and x_1 and x_2 , resp., represent the progress of reactions (1) and (2) at time t . In the majority of expts. a $\text{CH}_3\text{CO}_2\text{Na}$ concn. = 0.4 N was employed. The following is a summary of the results obtained in the investigation: The velocity of the reaction between H_2O_2 and I is rigidly proportional to the concn. of the former. It is also proportional to the concn. of the I_2 ions; but for high acetate contents ($[\text{CH}_3\text{CO}_2\text{Na}] > 1.0 N$) there is a lag in the velocity. The velocity, which is essentially dependent on the products of the reaction, decreases with increasing H^+ and I^- concn. The power q (where $q = \Delta \log k_t / \Delta \log [\text{H}^+]$), according to which the velocity decreases with increasing H-ion concn., lies between -1 and -2 , its value decreasing as the I-ion concn. increases. For $[\text{I}^-]$ between the limits 0 and 0.1 N , the value of q is expressed by the equation: $q = 1.50 + 0.50 e^{-402.5[\text{I}^-]}$. Within the accessible range of measurement, the power, p , with which $[\text{I}^-]$ enters the velocity equation, lies also between -1 and -2 . From the relation between $[\text{I}^-]$ and the velocity, the "order" of reaction (1) or (1') with respect to the I ion may be so formulated that it passes through a minimum at about -4 for very small I-ion concns. On either side of this minimum the order of the reaction increases: with decreasing I-ion concn. the order of the reaction increases rapidly towards -2 or perhaps -1 , while with increasing I-ion concn. it increases more slowly towards -1 . The course of the order of the reaction, corresponding to $[\text{I}^-]$ between 0.001 N and 0.1 N , may be constructed through integral *Hallepunkte* ($-4.0, -3.0, -2.0, -1.0$), thus giving it the character of an abrupt change and cutting the concn. range into 4 regions (I, II, III, IV). Values are given for the approx. limits of these concn. regions and for the corresponding velocity constts. Under otherwise similar conditions, the velocity of reaction increases with the acetate concn. For $[\text{I}^-] = 0.03 N$ this rise, at 25° , is given by the expression:

$k_1[\text{I}^-] = 0.03 N \lim [\text{I}_2^-] = 0 = (2.67 + 12.0 \alpha [\text{CH}_3\text{CO}_2\text{Na}] + 10.8(1 - \alpha)^2 [\text{CH}_3\text{CO}_2\text{Na}]^2) \cdot 10^{-11}$, where α is the degree of dissociation and $[\text{CH}_3\text{CO}_2\text{Na}]$ the total concn. of acetate in g.-mols. per l. Within the region I to IV, with a const. excess of $\text{CH}_3\text{CO}_2\text{Na}$ ($d. = 0.4 N$), the time law of reaction (1') is given by the simultaneous differential equations:

$$\frac{dx_1}{dt} = \bar{k}_1 \text{ I; II; III; IV } \quad [\text{I}^-]_t \frac{(a-x_1-x_2)[\text{I}_2^-]_t}{(K_s \frac{c+x_1-x_2}{ad})^{1.50-0.50 e^{-402.5[\text{I}^-]_t}}}$$

and $dx_2/dt = \bar{k}_2(a-x_1-x_2)[\text{I}^-]_t$, where $\bar{k}_2 (= 0.78)$ is the velocity const. of the $\text{H}_2\text{O}_2-\text{I}^-$ reaction and K_s is the dissociation const. of $\text{CH}_3\text{CO}_2\text{H}$. It follows from these relations that the $\text{H}_2\text{O}_2-\text{I}_2$ reaction is negatively autocatalytic with respect to H^+ and I^- . The $\text{H}_2\text{O}_2-\text{I}^-$ reaction is positively autocatalytic with respect to I , while with respect to H^+ and I^- it is negatively or positively autocatalytic, according as $x_1 > \text{or} < x_2$. The many deviations of the $\text{H}_2\text{O}_2-\text{HI}$ reaction from the rigid bimol. time law that have been observed and reported in the literature, are due to the simultaneous occurrence of the $\text{H}_2\text{O}_2-\text{I}_2$ reaction.

H. JERMAIN CREIGHTON

The influence of catalytic agents on the combustion of cane sugar. J. ARVID HEDRVAL. *Svensk Kem. Tidskrift* 32, 99-103 (1920).—If cane sugar is heated in the

flame of the Bunsen burner it will turn brown and fuse. A foreign substance previously added to sugar may cause a very different phenomenon, depending upon the nature of the substance which is added. The sugar may behave as before (Type I); burst into flame emitting smoke rings and leave a normal ash (Type II); or finally burn with a flame and smoke rings and in addition thereto form a black porous residue (Type III). The intensity of the flame and smoke rings and the amt. and shape of residue vary with the substances added to the sugar. The following substances when added to the sugar cause no change (I, above): BeO , Al_2O_3 , $\text{Al}(\text{OH})_3$, TiO_2 , SiO_2 , SnO , SnO_2 , As_2O_3 , Cr_2O_3 , MoO_3 , U_3O_8 , MnO , Fe_2O_3 (under certain conditions), NiO , Al and Ni filings (see reduced Ni below), reduced Fe , HNO_3 , $\text{CH}_3\text{CO}_2\text{H}$, CaF_2 , BaSO_4 and $(\text{NH}_4)_2\text{CO}_3$. The oxides of alkalis, earths and heavy metals, except those listed above, fall into type II. The flame produced is more vigorous with the alkalis than with the earths and least so with the heavy metals. To the flame producers also belong the metals: Ag , Cu , Pt , Zn , reduced Ni , and Co . Of these last the Zn gave the most flame and Ni the least. The following substances belong to type III, giving both a flame and carbonaceous residue when added to cane sugar to be tested by the flame; halogens and halogen salts (except CaF_2), P_2O_5 , H_2SO_4 , SO_2 , alkali and alkali earth salts except $(\text{NH}_4)_2\text{CO}_3$, CuSO_4 , and FeSO_4 .

A. R. ROSR

Catalysis. XIV. The mechanism of the inversion of sucrose. CATHERINE M. JONES AND WM. C. MCC. LEWIS. *J. Chem. Soc.* **117**, 1120-33 (1920).—The velocity of inversion of sucrose in the presence of $0.1\text{ }N\text{ H}_2\text{SO}_4$ was detd. at 20, 30, 40 and 50° , the compn. of the soln. being altered by gradual displacement of H_2O by sucrose. The constns. vary with the initial concn. of the mixt. and in all cases the displacement of H_2O by sucrose causes a definite increase in the velocity const. as a further illustration of the anti-catalytic effect of H_2O . In order to account for the alteration in the const. the av. activities of the H ions were detd. in the various mixts. at 20 and 40° , and it was found that the complete explanation could be made by allowing for the stoichiometric correction for the H_2O and for the change in activity of the H ions, which increases with increasing sucrose content, exactly as would be the case if a neutral salt were added. Thus the inversion process is *bimolecular*, consisting of 2 processes, (1) the practically instantaneous union of non-hydrated H ion with non-hydrated sucrose mol. ($\text{R} + \text{H}^+ = \text{RH}^+$), and (2) the actual inversion reaction, $\text{RH}^+ + \text{H}_2\text{O} = \text{dextrose-leulose}$. The mean values of the const., 1.27×10^{-6} at 20° and 2.305×10^{-5} at 40° , are defined by the expression: $k_{bi} = k_{uni}/[\text{H}_2\text{O}][\text{H}]$, where k_{uni} is the observed unimol. velocity const., $[\text{H}_2\text{O}]$ is the concn. of H_2O ($M = 18$), and (H^+) is the activity of H ion. Hence the values of k_{bi} are independent of concns. of sucrose or H_2O and also of the activity of the acid catalyst, and depend only on temp. It is further concluded that the H ions and the sucrose mols. are not sensibly hydrated in aq. soln. In agreement with Rosanoff's suggestion regarding the mode of expressing the influence of solvent catalysts, the activity of the H ion is found to be an exponential function of the concns. of sucrose and H_2O present. The environmental catalytic influence of a mol. of sucrose is identical in magnitude with that exerted by 1 mol. dextrose + 1 mol. leulose.

G. L. CLARK

Determination of solution densities. Determination of the difference in density between air-free water and water saturated with air. O. E. FRIVOLD. *Physik. Z.* **21**, 529-34 (1920).—A differential app. is described in detail for comparing the d. of any soln. with a liquid of known d. as a standard. The difference in d. between air-free water and water satd. with air was found to be 19.02×10^{-7} at 15.6° .

A. E. S.

Planck's theory of dilute solutions. P. BOEDKE. *Physik. Z.* **21**, 551-2 (1920); cf. *C. A.* **14**, 2286.—P.'s theory is extended to concd. solns. Terms of the second order are included. Expts. on binary mixts. with closed satn. curves are necessary for further extension of the theory.

A. E. STEARN

Short review of colloid theory. H. D. MURRAY. Oxford Univ. *Sci. Progress* 13, 234-42(1920).—A discussion of dispersion, Brownian movement, electrostatic forces, surface energies (positive and negative), osmotic forces, and coagulation. The treatment is, in part, mathematical. "The phenomena of coagulation have provided us with our deepest insight into dispersoid systems, and it is from this direction that our future knowledge will probably come."

JOSEPH S. HEPBURN

Color changes during the coagulation of sulfide hydrosols. FRIEDRICH-VINCENZ v. HAHN. Leipzig. *Kolloid-Z.* 27, 172-5(1920).—Silver sulfide hydrosols pass through a range of colors from yellow to green on the addition of increasing amounts of KCl. The ppt. is invariably brown, but on shaking it with water a color is imparted to the soln. which depends upon the method of coagulation and also upon the age of the sulfide. The color is not dependent upon the salts employed for the prepn. of the Ag sols nor yet upon the nature of the ions that cause the pptn.

F. B. SPEAR

Hydrous oxides. II. H. B. WEISER. Rice Inst. *J. Phys. Chem.* 24, 505-38 (1920); cf. *C. A.* 14, 2738.—From a complete survey of the literature substantiated by expts. the conclusion is reached that Al_2O_3 forms but one definite hydrate—the trihydrate pptd. from a soln. of the oxide in caustic alkali. An indefinite no. of hydrous oxides, such as those pptd. by NH_4OH from sol. Al salts, may exist, differing in the size of particles and amt. of H_2O they contain and soly. in acids and alkalies. Thus the colloidal alumina formed by boiling Al acetate is insol. and has no mordanting action, while that prepd. by peptizing alumina gel with $AlCl_3$ and dialyzing in the cold, is sol. in acids and is a mordant. Colloids with properties intermediate between these two extremes are readily prepd. Colloidal alumina is positive in charge and is stabilized by preferential adsorption of cations, with the following order based on peptizing power: $HNO_3 > HCl > FeCl_3 > AlCl_3 > CH_3CO_2H$. Such colloids are not composed of basic salts. Pptn. is reversible when strong acids with univalent anions and their salts are used on account of the weak adsorption of the anion which is readily removed by washing. The pptn. is irreversible with acids with multivalent anions and their salts where adsorption is strong and is not affected by washing. Other observations confirm the conclusions from the former work on hydrous ferric oxide.

G. L. CLARK

The degree of association of the molecules of binary salts in non-aqueous solutions; a contribution to colloid chemistry. P. WALDEN. *Kolloid-Z.* 27, 97-101(1920).—Binary salts in the fused state form highly associated mols., and when dissolved are the best typical electrolytes. For these reasons W. has chosen them for this work on the association of salts in various solvents. As the dielec. const. (ϵ) of the solvent is an important factor, the association of the dissolved mols. can be varied over a wide range by using solvents with diff. values of ϵ . The range of mol. complexity can thus be made to include ions, complex ions, mols. and polymerized mols. Salts of the type KCl, KI and NaI were not used because of their slight soly. in most non-aq. solvents, W. employs, therefore, tetraalkylammonium compds., showing that their behavior is analogous to that of typical binary salts; the order of magnitude of their degree of ionization in H_2O , acetonitrile, and formamide is cited to emphasize this point. The solutes employed were $N(C_2H_5)_4I$, $N(C_4H_9)_4I$, and iso- $N(C_4H_9)_4I$ in the following solvents: $HCONH_2$, $MeNO_2$, $MeCN$, $PhNO_2$, $MeOH$, $EtOH$, CH_2Cl_2 , iso- C_4H_9OH , $AcOH$, $CHCl_3$, C_6H_6 , CCl_4 . This gives a series with decreasing ϵ from 94 to 2.2. The degree of association (x) is calcd. from the ratio of mol. wt. observed: mol. wt. theoretical. Values of x so calcd. range from 0.57 ($N(C_2H_5)_4I$ in $HCONH_2$) to ∞ ($N(C_4H_9)_4I$ in CCl_4). In other words, x is clearly shown to increase greatly as ϵ of the solvent becomes less. As CCl_4 and C_6H_6 give values approaching ∞ for the association of $N(C_4H_9)_4I$, particular interest attaches to these. A special study by the ebullioscopic method was therefore made of these solns., and the alteration of the b. p. was found to be zero within the limit of exptl. error. Measurement of the mol. cond. showed no abnormalities.

It is therefore reasonable to suppose that the ebullioscopic properties of these solns. were not abnormal, and that the phenomenon observed is really due to the very large mol. wt. of the substance in soln. In some cases this reached values 80 times that of the theoretical mol. wt., and the solns. may be considered colloidal in such cases. "From the standpoint of colloid chemistry one can say with Wo. Ostwald that these must be thought of not as colloidal substances, but as substances in the colloidal state." *Conclusion:* Highly polymerized binary salts can be made to assume all degrees of mol. complexity, which in solvents of small ϵ (in the neighborhood of 2), approaches the colloidal condition.

H. W. BANKS, 3RD

The theory of Brownian movement. L. WERTENSTEIN. *J. physique et le radium* 1, 63-4(1920).—A short mathematical discussion of the deduction of the equation of such movement.

E. D. WILLIAMSON

Electrolytic conductivity of gelatin mixtures and its alteration with the transformation of the gelatin. F. RETTIG. Berlin. *Kolloid-Z.* 27, 165-72(1920).—Measurements were made of the electrolytic cond. of gelatin-water solns. of various concn. and the changes detd. that are caused by long heating, or by the addition of certain salts. The cond. of both pure and impure gelatin in water for a given temp. increases with the concn. It also increases after heating due to the transformation of the gelatin into the β variety. This transformation is irreversible and is more rapid the greater the concn. When salts are present the rate is detd. to a considerable degree by the nature of the ions. For small additions of salt the cond. of the gelatin-salt-water mixt. is greater than that of the salt-water alone, while for greater concns. of salt this relation is reversed. In this connection at higher concns. of salts of the same cation the effect ran: $\text{SO}_4^{--} > \text{Cl}^- > \text{Br}^-$, thus showing an agreement with the Hofmeister series.

E. B. SPEAR

The mobility of the electrolytic ions. M. BORN. Frankfurt. *Z. Elektrochem.* 26, 401-3(1920).—A theoretical discussion of the mechanism of electrolytic mobility. It is pointed out that since the mols. of H_2O are permanently dipolar, as indicated by the investigations of Debye, then if an ion is present in H_2O , the oppositely charged side of these mols. will be turned to the ion. If now the ion acquires motion, the dipolar H_2O mols. must turn in following it. In consequence of the viscosity of the H_2O , the axis of the dipolar H_2O mols. is always displaced a little towards the momentary direction of the elec. field, thus causing two effects: a retarding or braking force due to the field not being homogeneous, and a moment of rotation on the H_2O particles which consumes the energy of mobility of the ion. It is shown that Stokes' formula holds for a charged sphere of radius R in a dipolar liquid, if R is replaced by an apparent radius $R^* = [1 + (1/3)(R_0/R)^4]$. The "characteristic radius" R_0 depends upon the valence, n , of the ion, the temp., T , and the dipolar moment, M , of the H_2O mols., i. e., $R_0 = \sqrt[4]{anFM/RT}$, where F is the Faraday const., R the abs. gas const., and α a number which may vary between the reciprocal of the dielec. const. and unity. Cf. *C. A.* 14, 2113.

H. JERMAIN CREIGHTON

The question of the hydration of the electrolytic ions. RICHARD LORENZ. Frankfurt. *Z. Elektrochem.* 26, 424-31(1920); cf. preceding abstract.—A mathematical and theoretical paper, in which the question of the hydration of the electrolytic ions is discussed from the standpoint of "space filling and ionic mobility" (cf. *C. A.* 14, 2571). The limiting values for the space-filling numbers (ψ) are $0.74 > \psi > 0.25$. For different types of ions ψ has the following mean values: univalent org. cations, 0.37; univalent org. anions, 0.65; bivalent org. cations, 0.52; inorg. complex cations, 0.51. The space-filling number for hydrated ions (ψ_h) exceeds the upper limiting value of ψ . It is shown that the mobility of hydrated ions (u_h) may be expressed by the equation: $u_h u \sqrt{\psi/\psi_h}$. For the bi- and multivalent org. anions, the value of ψ approximates unity, indicating that these ions are hydrated. Of the ψ values of the elementary anions and cations

only those for Na^+ and Tl^+ lie between the limiting values given above; all others lie above or below these values. Cl^- , Br^- , I^- , K^+ , Rb^+ , Cs^+ migrate too rapidly, while Li^+ and the bivalent ions of the alkaline earths migrate too slowly. In the case of hydrated ions it is necessary to differentiate between 2 kinds of mobility, i. e., that of the uncharged spheres and that of the charged spheres. The former is termed hydrodynamic mobility and the latter electrodynamic mobility. In conclusion, the values for the mobilities of the ions of the alkali metals in relation to their radii are discussed from this standpoint and that of Born's theory of the mobility of the electrolytic ions.

H. JERMAIN CREIGHTON

The relation between the volume and the velocity of some organic ions. H. W. SMITH. Johns Hopkins Univ. *J. Phys. Chem.* **24**, 540-61 (1920).—A compilation of the data shows that the velocity of an org. ion, or its equiv. cond., is independent of the mass and of the configuration. It does depend, however, upon 2 factors: (1) the sp. nature of the nucleus or polar group to which the ion owes its chem. properties, or the secondary valence forces which bind the ion to the solvent, e. g., whether primary, secondary, tertiary, quaternary or pyridine N derivs.; and (2) the total vol. of the ion as calcd. by the rules of LeBas. In any series of ions having a common ionic nucleus, e. g., $-\text{COO}'$, $-\text{NH}_2'$, $-\text{NH}'$, etc., apart from certain well defined disturbing influences, the velocity is an inverse exponential function of the vol., viz. $\sqrt[4]{U/\Omega} = \text{const.}$, where γ is empirically detd. For primary N derivs. $\gamma = 1.85$ even for ring-containing compds. such as aniline; for secondary, tertiary and quaternary N nuclei $\gamma = 1.6, 1.5$ and 1.85 resp. In the last group mentioned is to be found every sort of org. configuration. For diamines $\gamma = 3$, and deviations may be explained upon the basis of internal condensation and consequent contraction. For quaternary phosphonium compds. $\gamma = 2$, and here again the nucleus is unaffected by ring formation. The values of γ for acids are as follows: aliphatic monobasic, 2.5; aromatic monobasic, 2; dibasic, 2.5; the sulfuric acids, 2. The formation of a new group when the carboxyl is associated with a ring, with greater velocity than the aliphatic group—an effect opposed to the negligible influence of rings upon N nuclei—indicates an extensive rearrangement of secondary valency. Furthermore, the carboxyl is much more sensitive to the influence of other groups. An $-\text{OH}$ group, for example, causes marked exaltation in ionic velocity.

G. L. CLARK

Hydrogen overvoltage. DUNCAN A. MACINNES. *J. Am. Chem. Soc.* **42**, 2233-8 (1920).—A reply to the criticism of Newberry (*C. A.* **15**, 25). E. H. DARBY

The solution of metals in acids as related to corrosion. WM. D. RICHARDSON. *Trans. Am. Electrochem. Soc.* **38**, preprint (1920).—The rates of corrosion (air) of metals, and of soln. in acids, do not follow the electrochem. series. Factors affecting the rates are soln. tension and H influence chiefly, and to a lesser degree the influence of O, CO_2 , of the cathode, and of the halogens. Many catalyzers affect the rate. Indications of the H and O influence may be given by treating the metals as couples in dil. acids and neutral salts. In general, rolled and cast ferrous metals show different and opposite behavior in HNO_3 , H_2SO_4 , and in HNO_3 with several metallic catalyzers. Under conditions of corrosion, the cast metals are relatively less attacked in the presence of much O than are the purer rolled metals. Cast metals are more passive to oxidizing than to non-oxidizing acids. Ag, Cu, and HCHO as catalyzers reverse this action. Pt is without action on cast metals in any acid, but acts negatively on rolled metals in HNO_3 , and positively in H_2SO_4 and HCl. In HNO_3 , the catalyzers Ag, Cu, and HCHO, act negatively on the soln. rate of Cu-bearing and pure open-hearth Fe, and positively on gray cast iron and semi-steel. Cu and Ag show no pronounced change in the soln. rate of the above metals in H_2SO_4 or HCl. HCHO on the contrary catalyzes them negatively in H_2SO_4 and HCl. Pt catalyzes Cu-bearing and pure open-hearth Fe positively in normal H_2SO_4 and HCl, and negatively in normal HNO_3 . Cu is not certainly cata-

lyzed by any of the catalysts used. Al is not affected by any of the catalysts in HNO_3 or H_2SO_4 . C. H. ELLINGER

Thermodynamics and probability. A. BERTHOUD. *J. chim. phys.* 17, 588-624 (1920).—The author, starting from the theory of probability, derives several formulas which are the same as those obtained by thermodynamic reasoning. Examg. attempts of Arrhenius and others to find cases where the 2nd law does not hold, he finds them erroneous in that they deal with uncompleted processes. W. P. WHITE

A sensitive method of thermal analysis, and the transformation points of quartz, of iron, and of nickel. ALBERT PERRIER AND F. WOLFFERS. Lausanne. *Arch. sci. phys. nat.* 2, 372-81 (1920).—The method described, which is essentially a continuous comparison of the sp. heat of a substance at different temps. to discover thermal transition points, has been proved to be both sensitive and practicable. Applied to crystd. quartz, Fe, and Ni, it revealed all the thermal anomalies heretofore known, and in addition several new ones previously unknown on account of their being less pronounced. The transition points of Fe, α to β to γ , are particularly well marked. J. T. R. A.

Thermochemical analysis of solutions. JOB P. CHAUVENET AND G. URBAIN. *Compt. rend.* 171, 855-7 (1920).—By mixing equimolar solns. of two salts in varying ratios, but maintaining a const. total vol., the measured "heat of mixing" was found to exhibit maxima or minima depending on whether they were positive or negative. These points of max. or min. effect indicate the formation and compn. of double or complex salts, e. g. $(\text{CdI}_4)\text{K}_2$; $\text{CuCl}_2 \cdot 3\text{CaCl}_2$; etc. A. E. STEARN

The specific heat of saturated vapors at low temperatures. G. BRUHAT. *Compt. rend.* 171, 712 (1920).—A reply to a criticism by E. Aries (*C. A.* 15, 7.). E. D. W.

The effect of asymmetry. A study in crystal structure. THOMAS VIVOND HARKER AND MARY WINEARLS PORTER. Oxford. *J. Chem. Soc.* 117, 1303 (1920).—The object of this paper, which is a crystallographic study of some compds. of the type $\text{R}_3\text{N}(\text{HgI}_2)$, is to ascertain whether a definite similarity may exist between two closely related org. compds., one of which differs from the other in possessing an asymmetric atom. No cases of isomorphism were encountered when R_4 is wholly represented by alkyl groups. Three compds. of the type $\text{R}_3\text{PhNHgI}_2$ were found to be isomorphous— $\text{Me}_3\text{EtPhNHgI}_2$, $\text{MeEt}_2\text{PhNHgI}_2$ and $\text{Me}_2\text{PrPhNHgI}_2$. Two compds. of the type $\text{R}_2(\text{CH}_2\text{Ph})\text{PhNHgI}_2$, the racemic methylethyl and the corresponding diethyl derivs., are isomorphous. A crystallographic description, including the Federov "transformation equations" and "complex-symbol," is given for a number of these compds. RALPH W. G. WYCKOFF

Remark on the existence of binding rings in diamond. N. H. KOLKMEIJER. *Proc. Acad. Sci. Amsterdam* 23, 120-8 (1920).—A review of the work of Debye and Scherrer (*C. A.* 13, 1415) and of Coster (*C. A.* 14, 2443). The theory of D. and S. that the electron rings do not act as bonds in the structure of the diamond is accepted.

CHESTER B. SLAWSON

Crystal structure. W. LAWRENCE BRAGG. Royal Inst. of Gt. Britain, May 28, 1920, 14 pp.—The atomic diam., the distance between the atoms of any element, is const. for all cryst. compds. of that element. In any series of the periodic arrangement the univalent electropositive element has the greatest diam., the bivalent the next greatest, and so on through the series until it reaches a lower limit for the univalent electronegative element. For elements with the same valence those with the highest at. numbers have the greatest at. diams. Two types of chem. combination in crystals are distinguished: (1) Salts in which oppositely charged atoms are held together by the electrostatic attraction of their charges. Bi- and tri-valent atoms have double and treble binding forces which gives a greater hardness to the crystal structure. (2) Similar charged atoms held together by electrons common to both atomic nuclei. The extremely hard crystal structures of diamond and carborundum are of this type. (Cf. *C. A.* 14, 3013, 3584, 3585.) CHESTER B. SLAWSON

Statement to the Color Committee (of A. O. C. S.). I. G. PRIEST. *Cotton Oil Press* 4, No. 6, 45-7(1920).—A brief statement of the elementary ideas on which colorimetry as a science is based including definitions for color, hue, satn., brilliance, light, homogeneous light, transmission, transmittance, and transmissivity. H. S. B.

Three lecture experiments. A. CARDOSO PEREIRA. *Rev. chim. applicada* 4, 174-81(1919).—In making the usual closed tube test for As, by reduction of As₂O₃, etc., with charcoal, a closed tube constricted toward the lower end is employed, containing the suspected substance at the bottom. The tube at the beginning of the constriction is plugged loosely by a wedge of wood charcoal, which is heated to redness before the arsenical material is heated, thus causing all vapors to pass through the reducing atm. at the constriction, resulting in greater sensitiveness of the test. The formation of complexes containing metals in biological liquids may be demonstrated by adding 10 drops of a soln. of ferrous lactate to 1 cc. of blood serum, followed by a few drops of K₄Fe(CN)₆ soln. No blue color is produced, showing the existence of the Fe in an uni-onizable form. The addition of acid produces the customary blue color. In testing for morphine with FeCl₃ soln., the time lost in the necessary neutralization and diln. of the latter is avoided by using only a very small drop of the soln. applied on the tip of a glass rod. M. R. SCHMIDT

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

Absorption limits of the L-series. G. HERTZ. *Z. Physik* 3, 19-25(1920).—H. measures wave lengths of the three abs. limits of the L-series for elements from Cs

to Nd, by interpolation on photographs taken with a stationary reflecting crystal. A_2-A_1 coincides with the Sommerfeld L-doublet, but A_3-A_1 is five times as great as the Λ -doublet. F. C. HOYT

The fine structure of the discontinuities in X-ray absorption spectra. M. DE BROGLIE AND A. DAUVILLIER. *Compt. rend.* 171, 626-7(1920); cf. *C. A.* 14, 3364.—The appearance of X-ray emission and absorption spectra lead one to expect fine absorption lines in the vicinity of the heads of the bands. The authors note the existence of such a line (max. of transmission) of wave length slightly greater than the edge of the ordinary transmission band of Ca tungstate. Similar lines were indicated in a study of the K band of Ag by the ionization method. BURNS

The X-ray absorption spectra of various forms of phosphorus. J. BERGENGREN. *Compt. rend.* 171, 624-6(1920).—By means of a vacuum spectrograph having a crystal of gypsum for dispersive agent, B. examd. the absorption spectra of NH_4 phosphate, Bridgman's black P, H_3PO_4 , and com. red P. The sample was spread on a thin screen, between 1 mg. and 2 mg. of P per cm^2 being used. The anticathode was of W and its spectrum was used to det. the wave-length scale of the absorption spectrum. The black P showed a limit of absorption at $\lambda 5.767\text{\AA}$, while for the compds. the limit was $\lambda 5.750\text{\AA}$. The red sample showed a double limit, corresponding with both these positions. B. thinks that this is the first example of an X-ray spectrum being influenced by the state of an element, and considers allotropy of greater importance in this respect than chem. combination. BURNS

Influence of an external electric field on the rotation spectrum. An analogy to the Stark effect. GERHARD HETTNER. *Z. Physik* 2, 349-60(1920).—Supposing a diatomic gas mol. to have an elec. moment, H. works out the quantizing of it according to the Schwartzchild-Epstein modification of Sommerfeld's method. (Cf. *C. A.* 13, 921; *Physik. Z.* 20, 289-94(1919). The results show that with an external elec. field there should be both a shift and splitting of the spectral lines of the H halides large enough to be observed with Limes' app. (*Sci. Abs.* 23, 82). F. C. HOYT

Conditions for the excitation of mercury lines. R. SEELIGER. *Z. Physik* 2, 405-14(1920).—S. studies the intensity of Hg lines in a discharge tube as dependent on distance from the cathode, using the method previously developed (*Ann. Physik.* 59, 589-612(1919)). The lines may be arranged as follows in order of distance from the cathode of maximum intensity: spark lines; first simple subordinate series; first triplet subordinate series; second simple subordinate series; second triplet subordinate series; 2536 \AA single line; 2847 \AA single line. According to an empirical rule this is the inverse order of the critical emission potentials. F. C. HOYT

The structure of the Balmer series of hydrogen lines. T. R. MERTON. *Proc. Roy. Soc. (London)* 97A, 307-20(1920).—It is perhaps remarkable that a precise knowledge of the Balmer series, which was at one time considered to be the most simple series known in spectroscopy, should still be wanting. It was shown by Michelson (*Phil. Mag.* (5) 34, 282(1892)), and in numerous later investigations, that the lines are complex but the values obtained by different observers for the sepn. of components are discordant. Merton has discovered that the structure of the Balmer lines is affected by the presence of impurities and has attempted (1) to describe qualitatively the character of structural changes, (2) to isolate conditions for obtaining the sharpest resolution of lines, and (3) to measure with the greatest possible accuracy the sepn. of these components under these conditions. Vacuum tubes containing very pure H showed H_α (6562 \AA) and H_β (4861 \AA) as broad unsymmetrical lines and gave no evidence of doubling, although the "half-widths" of the components of these two lines (0.040 and 0.080 \AA , resp., assuming the broadening is entirely due to the motions of the radiating particles) would indicate that the lines should be seen as fairly sharp doublets under ordinary conditions. The presence of impurities such as C compds., H_2O vapor, or He, make the lines

appear double and the conditions for sharpest resolution are attained by cooling a mixt. of He and H at a few mm. pressure to the temp. of liquid air. An echelon diffraction grating of 35 plates was used to investigate the sepn. width and intensity ratio of the components and the results are summarized as follows: H_{α} sepn. 0.145\AA , half width 0.028\AA , ratio of intensities 10:4.6; H_{β} sepn. 0.093\AA , half-width 0.045\AA . There is a considerable amt. of evidence that the fine structure of lines is not invariable, and though it cannot be claimed that the exact nature of the variation in the structure of the lines H_{α} and H_{β} has been established it seems probable that each of these lines consists of 3 (or perhaps more) components which show very great variations in their relative intensities under different conditions; one of these components in H_{α} and one in H_{β} appear to be sepd. from the main components of the lines by a constant difference in wave number, these components being prominent in impure H, and especially in a mixt. of H and He, while the other components, which are enhanced in very pure H, are sepd. from the main components by differences in wave number which are more appropriate to a principal series.

W. F. MEGGERS

Vacuum grating spectroscopy. J. C. McLENNAN. *Proc. Roy. Soc. (London)* 98A, 114-23(1920).—The author discusses the precautions necessary to permit the photography of the extreme ultraviolet, pointing out that one must work in vacuum or use either H or He in the spectrograph. The latter gas is preferable, or necessary, in work on wave lengths less than 900\AA . Starting with an instrument previously described (McLennan and Lang, *C. A.* 13, 1185), improvements are described which permit the photography of wave lengths shorter than those formerly obtained. The most important changes are the introduction of horizontal in place of vertical bearings for the gas-tight joints, and the provision of charcoal side tubes cooled by liquid air for the removal of exuded gases. A complete set of drawings accompanies the article, and detailed instructions as to the construction of the spectrograph. The apparatus is evacuated by means of two Tri-mount pumps, operated in series. The dispersive element is a concave grating of one meter radius. The performance of the spectrograph was tested by photographing the spectrum of a tungsten arc of the "Pointolite" type operated in an atmosphere of helium at a pressure of 30 cm. to 40 cm. The potential drop in the arc was 45 volts, giving the arc spectrum of He, but not the spark lines of short wave lengths. In the region $1025\text{--}1988\text{\AA}$ a large number of H lines were observed, a few lines due either to H or He, and some due to C. A number of faint lines were thought to be due to W vapor. Since there were impurities present in spite of the precautions taken to have pure He, the authors favors the suggestion of Lord Rayleigh to have the gas continually pass through an external circuit where it could be purified by charcoal immersed in liquid air. The use of O to eliminate the H is also suggested.

K. BURNS

Spark spectra of various elements in helium in the extreme ultraviolet. J. C. McLENNAN AND A. C. LEWIS. *Proc. Roy. Soc. (London)* 98A, 109-14(1920).—This investigation was undertaken to extend the spark spectra of certain elements into the extreme ultraviolet. The app. was essentially that described by McLennan *et al* (*C. A.* 13, 1417). The design was somewhat improved, however, by inclosing the spectrograph in a brass housing that could be well sealed and yet was convenient in operation. A glass spark chamber was designed so as to permit of easily changing the electrodes, and this was filled to atm. pressure with pure He. The spectra of Si, Te, Mo and Zr were photographed in the region $11600\text{--}18000\text{\AA}$. Only 3 new lines were found in the spectrum of Si. Numerous weak lines were found in the spectra of Mo and Zr, the shortest wave length being about 11650\AA in case on each. The spectrum of Te was found to be richer than those just mentioned, showing 10 lines below 11700\AA with the last at 11634\AA . A doublet at $11742\text{--}4\text{\AA}$ is ascribed by Lyman to Si. It was present in all these spectra. The results are given in a table.

K. BURNS

Arc spectra in vacuo and spark spectra in helium of various elements. J. C. McLENNAN, J. F. T. YOUNG AND H. J. C. IRETON. *Proc. Roy. Soc. (London)* **98A**, 95-108. (1920); cf. McLennan, Ainslie and Fuller, *C. A.* **13**, 1417.—The spectrograph described in the previous paper was used. In the case of Ca, Cu and Ag the electrodes were rods of the metal; metals of low m. p. were placed in hollow steel electrodes. In studying the spark spectra the metal was attached to the tips of steel electrodes, and the sparking chamber was filled to atm. pressure with purified He. The wave lengths were computed by the Hartmann dispersion formula, using as standards wave lengths previously detd. The probable error of the wave lengths is $\pm 0.5\text{\AA}$ or less. The results compared with any previously existing work, are given in the form of a table for each element. In the case of Sb over a score of new lines were observed of wave lengths less than 1800\AA , the shortest being 1437\AA . The spectrum of Bi was extended to 1435\AA . The Ca spectrum ends with a strong doublet at $1553\text{-}5\text{\AA}$. The arc and spark spectra are quite similar in this region. The Mg spark spectrum was found to be the same as that observed in an atmosphere of H by Lyman. The arc spectrum of Se was obtained by placing powdered Se in hollow carbons. Thirty-five lines were observed in the region $12296\text{-}1432\text{\AA}$, the only observations ever made in this region of the Se spectrum. The silver arc is not so rich in lines as the spark in the region $11888\text{-}1540\text{\AA}$, yet 25 lines were recorded within these limits. By using 15 amp. at 200 volts an intermittent Cu arc was obtained which permitted the extension of the Cu spectrum to 1216\AA . For this spectrum the grating spectrograph described in the preceding abstract was employed. The spark spectrum of Pb was observed, for the first time in this region, and extended to 1554\AA . Insofar as the two spectra correspond, the lines were compared with the values found in the arc by Saunders. The spark spectrum of Tl was extended to 1477\AA , the spark being found richer in lines than the arc. The spark spectrum of Sn was found to have very few lines in this region, although the arc is rich. The article is illustrated by plates of the various spectra. K. BURNS

A spectrographic arrangement for the study of the extreme ultraviolet. LEON BLOCH AND EUGÈNE BLOCH. *Compt. rend.* **170**, 226-8(1920).—By the use of an evacuated spectroscope provided with fluorspar lenses, prism and window, it is possible to get spark spectra as far as 1400\AA , correct to within half a unit. F. O. A.

Some new spark spectra in the extreme ultraviolet. LEON BLOCH AND EUGÈNE BLOCH. *Compt. rend.* **170**, 320-2(1920).—Using the spectrographic arrangement of the preceding abstr., spectra, from a condensed spark in a H atm., were obtained for Cd, Bi, Ni and Ag. The last two are specially rich in ultraviolet lines from $1500\text{-}1850$ and both have a prominent doublet close to 1550\AA . F. O. A.

Remarks on the constitution of the atom and band spectra. H. DESLANDRES. *Compt. rend.* **169**, 1365-71(1919); cf. *C. A.* **14**, 1254, 3588.—A comparison of the frequencies of bands of max. intensity, both absorption and emission, shows them to be multiples of a fundamental frequency occurring in the infra-red. This multiple effect is illustrated with many instances taken from the max. bands of several groups of N, C, O and their simplest compds. The bands may be in the infra-red, visible or ultraviolet regions. The deviations from this multiple law are much less than if they had been dictated by chance and are to be explained as due to the disturbing effect the electrons have on the vibrations of the nucleus. The spectra are described to vibrations of a cylindrical nucleus. F. O. A.

Recent advances in science—crystallography. ALEXANDER SCOTT. *Sci. Progress* **15**, 194-7(1920).—Discussion of recent work concerning the relation between the structure of a crystal and the structure of the atoms composing it. JOS. S. HEPBURN

Recent advances in science—physics. D. ORSON WOOD. *Univ. London. Sci. Progress* **15**, 184-8(1920).—Includes a summary of recent work on the nuclear constitution of atoms. JOSEPH S. HEPBURN

Molecular volumes of alkali halides (FAJANS, GRIMM) 2. Microchemical reactions of radium (DENIGÈS) 7.

4—ELECTROCHEMISTRY

COLIN G. FINK

The production of silico-manganese in electric furnaces. B. G. KLUGH. *Trans. Am. Electrochem. Soc.* 35, 401-10(1919).—Rectangular open-top furnaces are used in producing this material. A 3.4% Mn ore containing 15-33% SiO_2 is used in this work. Data are tabulated, showing a ratio of 3.53 of ore to metal; 73% of the Mn charged is found in the metal. When manganiferous slags from blast furnaces were treated with bituminous coal, the slag produced is 4.7 times the wt. of the metal. This slag, after treatment, contained only 1% Mn (20% originally), and the process showed a profit, even with a power consumption of 15,000 kw.-hrs. per ton of metal produced. The chief advantage of using silico-Mn over that of ferro-Mn and ferro-Si, is its saving of Mn and production of a cleaner, sounder casting. No extensive use has yet been made of this alloy.

W. E. RUDER

Step induction regulator (for electric furnaces). E. E. LEHR. *Elec. J.* 17, 510-4 (1920); cf. *C. A.* 14, 3196.—For (1) controlling the voltage of elec. furnaces, (2) high-voltage testing transformers, and (3) large high-voltage transmission systems, this regulator has distinct advantages over the ordinary type. The transfer and selector switches are free from arcing on account of zero voltage at moment of contact. The power factor and efficiency are high. The windings being transformer rather than motor types, are easy to insulate for high voltage, and also withstand heavy "shorts" on the line. The regulator can be disconnected easily without interrupting service.

F. H. HOTCHKISS

Some aspects of the electrolysis of iron. W. ALBERT NOYES. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—Electrolytic Fe is of great com. importance, though actually in use only at Grenoble, France. To det. the minimum p. d. at which transfer of Fe commenced, measurements were taken across Fe electrodes in FeSO_4 electrolyte. To avoid errors from "shorting," a 3-element vacuum tube was used, the p. d. being indicated by the plate-current galvanometer reading, under proper adjustment. The observed values varied from 0.60 v. at 20° to a minimum of 0.13 v. at $109-122^\circ$, then rose to 0.23 v. at 182° . Similar tests with Ni showed no such minimum. Studies on the % corrosion show that anode attack begins at lower voltages for higher temps., thus failing to explain the minimum with Fe. Against the H electrode, the Fe potential was found to be 0.428 v. At 15° a polarization potential of 0.2 v. was found at both anode and cathode in neutral FeSO_4 electrolyte (25 g. per l.), but if slightly acid the potentials were 0.04 and 0.28, resp. Raising c. d. increased these values greatly at both electrodes. Further expts. were carried out on ratio of p. d. to log. of current flowing, and explanation of results was offered. Literature references are given throughout.

F. H. HOTCHKISS

Progress in electroplating. L. ATCHINSON, S. FIELD, et al. *Electrician* 85, 625-6 (1920).—A brief report on papers on electrolytic Zn, Cu, Co, Ag, Ag + Au, etc. The Co bath recommended by Byron Carr consists of 4.5 lbs. CoSO_4 , 5 oz. boric acid and 2.5 oz. NaCl, bath temp., 34° ; for 2 min. immersion a c. d. of 150; for 3 min., 70 amp. per sq. ft.

C. G. F.

A substitute for transformer oil (carbon tetrachloride). ANON. *Elec. Rev.* 77, 889-90(1920).—The use of CCl_4 is advocated and its valuable properties as compared with oils are enumerated. Fatal explosions, such as occur with transformer oil, are impossible with CCl_4 .

C. G. F.

The Elwell-Poulsen arc generator. ANON. *Electrician* 85, 648-51 (1920).—A detailed account of this wireless apparatus. The anode is of Cu and the cathode of C (Acheson graphite). The cathode is kept rotating. The arc operates in a hydrocarbon atm., either coal gas, alcohol vapor or benzine vapor. 9 illusts. C. G. F.

The solution of metals in acids as related to corrosion (RICHARDSON) 2. Factors controlling the design and selection of suspension insulators (PRASLEE) 19. The manufacture of pulp by the electrolysis of salt solutions (FOURNIER) 23. Electric steels (CARLISLE) 9.

L'aluminium dans l'industrie électrique, rapports de la XV^e commission de l'Union des syndicats de l'électricité. Paris: Bureaux de la Revue générale de l'électricité. 104 pp.

PAULSON, HERMANN: *Gewinnung und Verwertung der atmosphärischen Elektrizität.* Hamburg: Verlag Boysen & Maasch. M. 11.

Primary electric battery. C. FERY. U. S. 1,356,977, Oct. 26. Structural features.

Primary electric battery. J. R. FENWICK. U. S. 1,357,858, Nov. 2. Structural features.

Electric battery for miners' lamps, etc. T. STRETTON. U. S. 1,357,126, Oct. 26. Structural features.

Accumulators. G. FROMONT. Brit. 148,501, July 10, 1920. The electrolyte of an accumulator of the Planté or pasted type consists of a soln. of a neutral salt of Na or allied metal, such as a satd. soln. of Na₂SO₄ at 15°. The cell may be made of sheet Pb and form one electrode, the other electrode being in the form of a plate having a terminal passing through but insulated from the cover. The filling aperture is closed by a screw or a spring-pressed valve. The seams of the cell may be coated with rubber soln. The cell is for use particularly with a lamp which may be carried by a socket fixed to the cell.

Storage battery separators. H. L. BOYER. U. S. 1,357,378, Nov. 2. A block formed of porous and insulating layers, such as alternating layers of cloth and rubber, is sliced transversely to the layers and the insulating portions of the sliced separators are deformed to project and form spacing bars.

Storage battery separators. H. L. BOYER. U. S. 1,357,379, Nov. 2. Separators are formed of slices from a block made up of alternate layers of porous and insulating materials such as cloth and rubber and treated with starch, glue or Na silicate, in order to stiffen the porous material.

Storage battery plate. C. P. ELIESON. U. S. 1,357,548, Nov. 2. Structural features.

Electrolytic cell. O. H. JEWELL. U. S. 1,357,400, Nov. 2. Cells for producing NaOH and Cl from NaCl soln. are formed with cathodes of current-conducting material such as steel or Ni and a diaphragm portion comprizing cotton cloth, paper or other organic substance which is not readily decomposed by the alkali present in the cell, protected by a porous covering such as cement or asbestos, to sep. it from the anolyte.

Electrolytic cell. W. M. JEWELL. U. S. 1,357,401, Nov. 2. Cathode elements for cells for producing NaOH, Cl and H from NaCl soln. are made in the form of hollow bodies with a porous diaphragm portion entirely encircling and in contact with the cathode. The main body of the cathode may be formed of Fe and steel and the covering of cloth or paper.

Electrolytic cell adapted for producing oxygen and hydrogen. T. B. WALKER.

U. S. 1,357,485, Nov. 2. The pat. relates to a float control of the electrolyte supply and other structural features.

Graphitizing carbon electrodes. F. R. KEMMER. U. S. 1,357,290, Nov. 2. In graphitizing C electrodes or similar articles, they are placed in an elec. furnace with their longest dimension vertical and an elec. current is then passed through the charge in a direction transverse to the length of the articles. This serves to minimize breaking or cracking of the articles during the treatment.

Electrolysis. H. DEBAUGE. Brit. 148,761, Jan. 30, 1919. An electrolytic cell is rotated so that centrifugal force assists in the sepn. of the products. The rotation may be effected by an elec. motor, which may also form the generator of the electrolytic current. A suitable construction is specified.

Electrolysis. H. DEBAUGE. Brit. 148,760, Jan. 30, 1919. The electrodes and electrolyte are rotated so that the products are exposed to centrifugal force. The electrodes may be secured to a rotating receptacle for the liquid, the anodes and cathodes being usually at different distances from the axis. Carbon or graphitized electrodes may be used. Gases are rapidly driven to the central space, and other products to the periphery. The invention is applicable to the refining of Cu, the extn. of precious metals, the treatment of Zn, Pb, etc., the production of Cl, Na_2CO_3 , hypochlorites, chlorates, O and H. persulfates, hyposulfurous acid, chromates, dichromates, K_2FeCy , KMnO_4 , white lead, chloroform, iodoform, and dyes, and the treatment of nitrates.

Metallic molybdenum. L. R. FÖÖRLAND. Norw. 30,305, Jan. 12, 1920. Mo free from C is manuf. by electrolyzing molten mixts. of salts which, in addition to Mo chloride, contain conducting salts of metals which have a greater affinity for Cl than Mo.

Electric separation of suspended particles from gases. E. MÖLLER. U. S. 1,357,486, Nov. 2.

Apparatus and mode of operation for removing suspended particles from gases by electric precipitation. A. F. NESBITT. U. S. 1,357,201-2, Oct. 26.

Electric apparatus for precipitating suspended particles from gases. A. F. MESTON. U. S. 1,357,886, Nov. 2.

Electric resistance crucible furnace. R. R. REED. U. S. 1,357,901, Nov. 2. The resistors are protected from oxidation during the operation of the furnace by surrounding them with molten glass, which also surrounds the crucible. The latter is centrally placed within the resistors and the resistors are so mounted as to provide for expansion and contraction of the glass.

Electroplating with tin. M. SCHLOTTER. Brit. 148,334, July 9, 1920. Dense adherent deposits are obtained from acid Sn salt solns. containing a colloidal substance and free from alkalis and NH_4 . A suitable soln. contains 120 g. SnSO_4 and 2 g. gelatin in a l. of H_2O . Such solns. are suitable for depositing on Cu, brass, or the like. For plating Fe galvanos previously to backing with molten Pb alloy, it is necessary, however, to add a substance having capillary activity, such as phenol or phloroglucinol. The electrolyte may then consist of 150 g. SnCl_4 , 2 g. gelatin, 5 g. phenol, 5 g. HCl, and 1 l. of H_2O .

Coating electric leading-in wires. H. BOVING. U. S. 1,357,216, Nov. 2. Leading-in wires of Fe, Fe-Ni alloy or Cu are coated with a mixt. formed of shellac and borax (with or without glycerol) in order to secure a tight seal with glass.

Covering leading-in wires. W. G. HOUSEKEEPER. U. S. 1,357,498, Nov. 2. Leading-in wires of incandescent lamps and similar elec. devices are coated with a mixt. of borax and gelatin (with or without glycerol) to effect union with glass.

Arc lamps. OPTISCHE-ANSTALT C. P. GOERZ AKT.-GES. Brit. 148,451, July 10, 1920. In a searchlight, graphite lubrication is applied to the carbons where they slide

through electrode heads and also, if desired, at the driving rollers. The electrodes may, for instance, be thinly coated with graphite by rubbing; or the graphite may be put on through the walls of the electrode heads. Wear on the elec. contacts and driving rollers, and strain on the regulating mechanism, are thus reduced.

Arc lamps. OPTISCHE-ANSTALT C. P. GOERZ AKT.-GES. Brit. 148,453, July 10, 1920. A positive C, which is so heavily loaded as to become red-hot, is surrounded with some clearance by a refractory tube reaching nearly to the arc. A protective gas jacket is thus formed, and the arc is confined to the end of the electrode. The tube, which is open at both ends, may be either of non-conducting material such as SiO_2 or fire-clay, or of conducting material protected at its end by a non-conducting liner. For a C of 16 mm. diameter, carrying 150 amp., the tube may have an inside diameter of 20 mm. and terminate 10–15 mm. from the end of the C. Wider tubes should be brought correspondingly nearer the ends of the carbons.

Arc-lamp electrodes. OPTISCHE-ANSTALT C. P. GOERZ AKT.-GES. Brit. 148,450, July 10, 1920. A searchlight electrode, which is to be so heavily loaded as to become red-hot, contains oxides or silicates to reduce the formation of soot. Ce oxide may, for instance, be added to the core instead of the usual Ce fluoride, or Si oxides are added to the shell, the core then containing Ce fluoride. Alternatively, the electrode may be jacketed with silicates.

Arc-welding electrodes. WILSON WELDER & METALS CO. Brit. 148,265, Dec. 16, 1919. The surface of a steel, iron or other metal rod for use as an arc-welding electrode is roughened or otherwise prepd., for instance, by rusting or oxidizing, before the application thereto of a weld-regulating substance such as $\text{Ca}(\text{OH})_2$. The rod is immersed in hot H_2SO_4 to remove scale, washed with H_2O , and then sprayed with dil. H_2SO_4 until a coating of rust has been formed, after which the rod is dipped several times in hot milk of lime. The rod may be dried or partly dried between successive immersions in the CaO bath. Consolidation of the $\text{Ca}(\text{OH})_2$ with the rod may be improved by baking the rod at 150° and drawing through one or more wire-drawing dies. The diameter of the rod initially may be 0.205 in. and, after drawing, 0.148.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Lead hydride. FRITZ PANETH AND OTTO NÖRRING. *Ber.* 53B, 1693–1710(1920); cf. *C. A.* 14, 3374.—A detailed account is here presented of the methods and app. used in prepg. this hydride. Attempts with Pb-Mg alloys gave doubtful results in spite of extensive variations in the compn. of the alloy and the conditions of its prepn. Feeble brown rings were sometimes obtained in the Marsh tube which from their location in respect to the flame could scarcely be due to As or Sb, but too slight for chem. identification. Various electrochem. methods were tried, such as direct-current electrolysis, with Pb cathodes, spraying by means of induction sparks or arcs in H_2 , colloidal dispersion, but without success. Finally, a combination of direct-current electrolysis with spraying was adopted. The app. finally devised is described in detail and by drawings. The cathode consisted of a Pb pencil 3 mm. thick fastened into a hard glass tube 7 mm. wide by means of a cement of pure PbO and glycerin. The electrolyte was 0.2 N H_2SO_4 and a current of not over 5 amp. at 220 v. was used. Formation of H_2 broke the circuit by forcing back the electrolyte from the cathode and sparking ensued. The acid was warmed to 60° before use and the whole app. immersed in a bath at 40° during a run. A Marsh tube was connected with the gas exit and metal mirrors were formed as soon as sparking began. Blackening of the wool filter showed the gas to contain fine Pb dust and much effort was required to obtain incontroverti-

ble proof that the rings were not due to metal particles so fine as to pass the filter. The cathode was at first fixed in its tube by plaster Paris, but when this was replaced by the PbO-glycerin cement the yield was so much increased that the gas, after passing a thick wool filter, could be condensed by liquid air; on revaporization it was again passed through a thick filter; a mirror appeared within 75 sec. after removal of the liquid air. The usual chem. reagents proved beyond doubt that the mirror consisted of Pb. Equally conclusive results, but with considerably reduced yields, were obtained by using as electrolyte 0.2 *N* KOH. Expts. were made using N₂ and CO₂ instead of H₂ to carry the gas without diminishing the yield. The poles were interchanged and Pb made the anode, but the anodically formed O₂ seemed to exert no ill effect and sufficient hydride for condensation and revolatilization was obtained.

A. R. M.

Fusion of the sulfides of zinc, cadmium and mercury. ERICH TIEDT AND ARTHUR SCHLEGELS. *Ber.* 53B, 1717-21(1920).—A pressure oven is described in which small amts. of material can be fused without contamination. The sulfides were prep'd. with great care for their purity. At 100-150 atm. and 1800-1900° ZnS formed the hexagonal modification (wurtzite) with a brilliant glaze of pale green-yellow tint. It was much more resistant to chem. action than the unfused sulfide. CdS fritted or fused at 100 atm. and 1750° had brilliant luster and dark yellow-brown color. HgS fused at 120 atm. and 1450° was not glazed but had a dull steel-gray appearance with red tone in places. Even gentle contact changed it to the red form. For fusion of alk. earth sulfides at 2000° 1 atm. was found sufficient but formation of a smooth glaze is promoted by higher pressure.

A. R. MIDDLETON

New modification of silicic acid. ROBT. SCHWARZ AND OTTO LIEBE. *Ber.* 53B, 1680-9(1920).—By hydrolysis of SiF₄ in boiling water, opaque, non-gelatinous scales were formed which, after dialyzing 8 days, contained 95% water and differed little from the product obtained by hydrolysis of SiF₄ at 0° in appearance or rate of dehydration over H₂SO₄. The chem. conduct of the first (*b*-acid) product was found to be entirely different from that of the second (*a*-acid); 1 g. of the latter with 95% water content dissolved in 1% HF in 9 min., while 1 g. of the former with the same water content required 36 min. The *b*-acid adsorbs practically no methylene blue, while the *a*-acid removes it almost completely from soln. In 5% NaOH the *b*-form showed much lower soly. than the *a*-form, both for water-rich and water-poor preps. In 3 *N* NH₄OH the *Q* value did not exceed 25 even in 49 days, and this value was reached only with water-rich, fresh preps.; aged or water-poor preps. gave about 15. The *b*-acid is concluded to differ from the *a*-acid in the larger size of the primary particles and in giving, upon soln., a more highly polymerized polysilicate. The analogies between these two forms of silicic acid and the two forms of stannic acid (Mecklenburg, C. A. 6, 1720) are very marked. Surprisingly, hydrolysis of SiCl₄ at 100° gave a product showing all the properties of the *a*-acid and with a value of *Q* = 48 in a gel 14 days old.

A. R. MIDDLETON

The oxidizing properties of sulfur dioxide. I. Iron chlorides. WM. WARDLOW AND FRANCIS H. CLEWS. *J. Chem. Soc.* 117, 1093-1103(1920).—The oxidation of FeCl₂ by SO₂ can be represented by the equation: $4\text{FeCl}_2 + \text{SO}_2 + 4\text{HCl} = 4\text{FeCl}_3 + 2\text{H}_2\text{O} + \text{S}$. This reaction is reversible. The most favorable conditions for the oxidation of a 33% soln. of FeCl₂ in HCl are a temp. of 95° and 10-20% SO₂ in the mixt. The highest yield of FeCl₃ in flask expts. was 8.8% in 33% HCl soln. at 115°, while expts. in sealed tubes gave 9.5%. Solns. containing 10 to 18.3% ferric iron are unchanged in the presence of SO₂ and HCl, but higher percentages result in slow reduction. Equil. is det'd. by the ratio Fe⁺⁺/Fe⁺⁺⁺, but the high conc. of HCl necessary to make the oxidizing properties of SO₂ operative seems to point to an intermediate formation of SOCl₂.

G. I. CLARK

Oxidizing properties of sulfur dioxide. II. Iron phosphates. WM. WARDLOW, S. R. CARTER AND F. H. CLEWS. *J. Chem. Soc.* 117, 1241-7 (1920); cf. *C. A.* 9, 2491 and preceding abstract.—Unlike FeCl_3 in conc. HCl soln., FePO_4 in conc. H_3PO_4 soln. was not reduced by SO_2 . Ferrous phosphate was oxidized by SO_2 with' deposition of S, the ferric iron becoming constant after 2-3 days, with 36% for a soln. containing 7.35 g. Fe in 250 cc. H_3PO_4 and with 45% for a soln. containing 3.65 g. in the same vol. of acid. The oxidn. is concluded to be reversible, the failure of SO_2 to reduce ferric phosphate being ascribed to formation of a very stable complex of the ferric salt with H_3PO_4 . The fact that SO_2 reduces most readily in weak acid and oxidizes most readily in strong acid is explained by assuming an amphoteric ionization of H_2SO_3 , the reducing action being due chiefly to SO_3^{--} which would be practically completely suppressed in strong acid soln.; in these $\text{OS(OH)}_2 \rightleftharpoons \text{SO}^{--} + 2\text{OH}^+$; $\text{OS}^{--} + \text{H}_2\text{O} \rightleftharpoons \text{S}^{--} + 2\text{OH}^+$; and $\text{S}^{--} + 4\text{Fe}^{++} \longrightarrow 4\text{Fe}^{+++} + \text{S}$, similar to the thionyl chloride hypothesis advanced in the case of the chlorides in conc. HCl . A. R. MIDDLETON

Hydrolysis of platinum salts. I. Potassium chloroplatinate. E. H. ARCHIBALD. *J. Chem. Soc.* 117, 1104-20 (1920); cf. *C. A.* 2, 1933; 6, 1563.—It is shown that solns. of K_2PtCl_6 undergo hydrolysis when exposed to light. If the concn. equals or exceeds 0.02 *N* the hydrolysis will begin and be completed in the dark; in solns. more dil. than 0.01 *N* no decompn. takes place when light is excluded. A substance (possibly a hydroxy salt) is formed by the hydrolysis which catalyzes the reaction, and will initiate decompn. in a freshly prepd. soln. Addition of sol. chlorides to the hydrolyzed soln. causes complete reversal of the reaction. Complete reversal of a 0.0005 *N* soln. requires nearly 2 years. A neutral salt retards slightly the direct action but does not influence the equil. point. Light affects the reverse reaction similarly as the direct. Pt black accelerates both direct and reverse actions in the dark, but the effect is not measurable when light is acting on the solns. A. R. MIDDLETON

Compounds of halogen derivatives of lead and thallium. BARLOT. *Compt. rend.* 171, 794-6 (1920).—The cond. of mixts. in various proportions of 0.01 *N* solns. of TlCl and PbCl_2 indicated clearly a compd., $\text{TlCl} \cdot \text{PbCl}_2$, and with less certainty, $2\text{TlCl} \cdot \text{PbCl}_2$. The former was obtained crystd. by cooling a boiling soln. of equimols. of the two chlorides. The latter could not be obtained in crystd. form. Conds. of 0.001 *N* soln. of the bromides and of 0.0005 *N* soln. of the iodides indicated the compds. $\text{PbBr}_2 \cdot \text{TlBr}$ and $\text{PbI}_2 \cdot \text{TlI}$ and these salts were also prepd. in cryst. form. Both are decompd. by prolonged boiling with a little water. The mol. coefficients of magnetization of the three compds. and of their constituents were detd. That of the chloride is about that calcd. by additivity from its components; those of the bromide and iodide are clearly different from the calcd. values, the bromide having a neg. value while the iodide is paramagnetic although the components are both diamagnetic. A. R. M.

The system ammonia-water. S. POSTMA. Amsterdam. *Rec. trav. chim.* 39, 515-36 (1920).—The last of a group of preliminary reports on this subject was published in 1914 (*C. A.* 8, 3161). This paper is an extended account in which the app. is illustrated and full data are given in tables and charts. The general results follow: The m. p. curve for the system $\text{NH}_3\text{-H}_2\text{O}$ was detd. from which it was deduced, from the 2 maxima, that 2 compds. exist: $\text{NH}_3 \cdot \text{H}_2\text{O}$ and $2\text{NH}_3 \cdot \text{H}_2\text{O}$. The b. p. curve at 1 and at 0.5 atm. was detd. by the dynamic method. The compds. had no considerable influence on the form of the b. p. curves. The b. p. curves at lower pressures were detd. by the results of detns. of the vapor tension of mixts. of varying compn. The course of these curves shows a strong dissociation of the compds. already at the m. p. The curve for the tension of NH_3 was represented by a formula which at the same time permits of detg. the heat of vaporization. The sublimation curve of NH_3 and the line of 3 phases ($\text{S}_{\text{NH}_3} + L + G$) in the system $\text{NH}_3\text{-H}_2\text{O}$ was detd. E. J. WITZEMANN

LORSCHIED, J.: *Lehrbuch der anorganischen Chemie*. 22nd ed. Freiburg i. Br.: Herder & Co. M. 16, 60, bound M. 21, 60.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Chemical standard samples. C. O. BANNISTER. *J. Soc. Chem. Ind.* 39, 351-2R (1920).—A brief report in which the need of suitable chemical standards, especially in iron and steel work, is pointed out. An outline is given of the work already done in preparing such standards in England and in the U. S. A. S. G. SIMPSON

New uses for mercuric chloride in technical analysis. A. SANDER. *Chem. Ztg.* 43, 597-8(1919).— HgCl_2 has been used with considerable success in the analysis of sulfates, sulfides, sulfites, bisulfites, thiosulfates and polythionates. In the analysis of oleum, the acid is first titrated with NaOH soln., using methyl orange as an indicator to obtain the total acid content. The H_2SO_4 present is changed thereby into NaHSO_4 . The neutralized soln. is treated with an excess of HgCl_2 , thereby half of the H_2SO_4 is set free as an equiv. quantity of HCl which can be detd. by further titration with NaOH soln. The SO_3 present along with SO_2 in gases from S burners or roasters can be found by absorption of the gases in NaOH soln. and titration to obtain total acidity first, and by an additional titration after the addition of HgCl_2 to obtain the SO_2 content. Sulfite liquors from wood pulp manuf. can be analyzed for their $\text{Ca}(\text{HSO}_3)_2$ and free H_2SO_3 content by the HgCl_2 method. In the examn. of crude soda liquors, advantage is taken of the fact that complex salts result from the decompn. of sulfides and sulfites by HgCl_2 and that in the corresponding decompn. of thiosulfates, free acid as well is liberated. The denitration liquors recovered from the manuf. of nitro artificial silk, can be analyzed by the use of HgCl_2 , so that each S compd. can be detd., such as sulfide, hydrosulfide and thiosulfate. ISMAR GINSBERG

The acidimetric determination of boric acid. J. A. M. v. LIEPMT. *Rec. trav. chim.* 39, 358-70(1920).— H_3BO_3 or HBO_2 can be titrated as a monobasic acid with phenolphthalein in the presence of considerable glycerol or a little mannitol. The work of Böeseken (*C. A.* 11, 38) indicates that erythritol, pentaerythritol, sorbitol and fructose can be used in the same way. To get more light on the subject, the reaction between boric acid and alkali with glycerol and fructose was studied electrometrically, the concn. of H being detd. after the addition of varying amts. of alkali and mannitol, etc. The plotted curves show discontinuities when the calcd. amt. of alkali had been added and the changes were more marked as the quantity of organic reagent was increased. Fructose appears to be more efficient than mannitol. Mixtures of acetic and boric acid can be analyzed electrometrically. An expt. was also tried with invert sugar. 25 g. of sucrose were dissolved in a little water and the soln. made neutral to phenolphthalein. 10 cc. of approx. 0.5 N HCl were carefully measured out and 25 cc. of 0.1 N H_3BO_3 . After standing 1 day in a closed flask at room temp. the soln. reacted with 63.00 cc. of standard NaOH , of which 41.40 cc. corresponded to the HCl added. This 21.60 cc. of alkali was used for the H_3BO_3 and the calcd. vol. was 21.53 cc. Cf. *C. A.* 14, 3385. E. J. WITZEMANN

Some results of the determination of potash by the Lindo-Gladding method. H. C. MOORE AND R. D. CALDWELL. *J. Ind. Eng. Chem.* 12, 1188-9(1920).—Fertilizer chemists have known that K_2O results are lower if the K_2PtCl_6 ppt. is washed with 80% alc. than when 95% alc. is used. This has usually been attributed to the greater solvent action of the alc. upon the ppt. but the expts. here described show that the trouble is due to a solvent effect or caused by the NaCl present. The A. O. A. C. method should be corrected. W. T. H.

The influence of potassium permanganate on Kjeldahl nitrogen determinations. DONALD C. COCHRANE. *J. Ind. Eng. Chem.* 12, 1195-6(1920).—N detns. made without the use of KMnO_4 on feeding stuffs and on feces are less accurate and always lower than when this reagent is used, although the contrary has been suggested by Frear in 1905.

W. T. H.

Note on the catalysis of permanganate titrations. PAUL H. SEGNIETZ. *J. Ind. Eng. Chem.* 12, 1196-7(1920).—Additional information is given to substantiate the well known fact that the addition of a little MnSO_4 at the start is helpful in titrating oxalates, H_2O_2 , etc.

W. T. H.

A qualitative test for cyanic acid. R. FOSSÉ. *Compt. rend.* 171, 635-7(1920); cf. *C. A.* 13, 2687.—The test depends on the tautomerization of NH_4CNO into urea. To test for CNO^- in a soln., take two samples, heat one of them 1 hr. with NH_4Cl ; to 2 cc. of each add 4 cc. AcOH and 0.3 cc. 10% methyl xanthidrol; if the wt. of xanthyl urea is greater in the second sample than in the first, the unknown probably contained CNO^- . *Expts.*—(a) Heat in tube 15 min. on water bath; 2 mg. AgCNO , 10 mg. NH_4Cl , 0.25 cc. water. Add 0.5 cc. AcOH , centrifuge, add a little xanthidrol; crystals of xanthyl urea appear. (b) Evap. 1 mg. AgCNO to dryness with NH_4Cl (0.02 g. AgCNO per 100 cc.). Grind residue with 0.33 cc. water and 0.66 cc. AcOH . Centrifuge, add without decanting, 0.05 cc. methyl xanthidrol, and mix. The xanthylated urea does not fail to appear. The same expts. performed after acidulation with HNO_3 , heating, making ammoniacal, adding NH_4Cl , then evap. to dryness, do not give the least trace of urea. The same negative results were obtained using much larger amounts of AgCNO .

ALBERT SALATHE

Microscopic qualitative tests for cyanic acid. R. FOSSÉ. *Compt. rend.* 171, 722-3(1920); cf. preceding abstract.—More AgCNO is sol. in hot water than in cold, so that by allowing the hot aq. soln. to cool, characteristic crystals can be obtained. In this way HCNO has been identified among the products formed by the oxidation of org. substances in ammoniacal soln. Co acetate gives an azure-blue color when added to a soln. of KCNO , owing to the formation of $\text{K}_2\text{Co}(\text{CNO})_4$. This compd. is hydrolyzed by water but is stable in alc. By this reaction it is possible to detect 0.35 mg. of HCNO as follows: Evap. to dryness on a porcelain capsule with KCl and $(\text{AcO})_2\text{Co}$. If cyanate is present an intense blue color will be obtained which will disappear upon addition of a drop of water and reappear on contact with alc. on the slide of the microscope. Under the microscope it is easy to distinguish between cyanates and thiocyanates, both of which give blue Co compds., in 3 ways: 1. Amyl alc., with or without Et_2O , is colored blue only by CoCNS . 2. Dil. acids decolorize CoCNO . 3. Fe^{+++} soln. gives a red color with CoCNS . Finally, it is possible to detect CNO^- under the microscope by adding a drop of FeCl_3 soln. to a soln. of 1 mg. AgCNO and 1 mg. NH_4OH .— HCl and evap. to dryness; a blue-violet color is produced.

W. T. H.

The application of diphenyl derivatives to qualitative reactions. P. FEIGL. Vienna. *Chem. Ztg.* 44, 689-90(1920).—Benzidine and other diphenyl derivs. can be used to detect very minute quantities of Mn^{++} , Ce^{++} , Ce^{+++} , Co^{++} , and Ti^{+++} by an intense color reaction. Add to 50-150 cc. of soln. dil. NaOH soln. until alk., heat to boiling filter, and wet the ppt. on the filter with a drop of a benzidine acetate soln. An intense blue color, disappearing soon if the metal ion was in very low concn., shows the presence of Mn , Ce , Co or Ti ion. It is best to use NaOH soln. containing traces of silicates or carbonates so that pptd. SiO_2 or CaCO_3 will adsorb the colored compd. The reaction, using benzidine, was found to be sensitive: (1) Mn to 1 part Mn in 125,000,000; (2) Ce^+ and Ce^{++} to 1 part in 50,000,000; (3) Co^+ to 1 part in 30,000,000; and (4) Ti^{++} to 1 part in 1,300,000. For Ce and Ti compds. hydrolyzing in H_2O , addition of NaOH is often unnecessary. Ti^{++} only will give a blue color with benzidine in either

acid or EtOH soln. Mn^{++} , Ce^{++} , Ce^{+++} , and Ti^{+++} , can be detected by this test in strong soln., Co^{++} only in very dil. soln. These reactions may be used in qual. analysis, by first sepgg. the metal ions into their respective groups, and then testing for the particular ones described above, either for detecting their presence or as a useful means of detg. complete washing of ppts. C. C. DAVIS

An extremely sensitive reaction of phosphates and arsenates and its application. G. DENIGÈS. *Compt. rend.* 171, 802-4(1920).—If to about 5 cc. of water a few drops of 10% $(NH_4)_2MoO_4$ soln. are added and the mixt. is treated with a few drops of $SnCl_2$ soln., a blue color is obtained (cf. Guichard, *Ann. chim. phys.* 23, 557). The blue reduction product can be removed from the aq. soln. by shaking with amyl alc., but not with Et_2O . Acids prevent the above reduction but the presence of a sol. phosphate causes it to take place even in the presence of acid. Now, however, the blue reduction product is of a different character and can be shaken out of the acid soln. with ether and it is also more stable in the presence of alkali. As little as 0.02 mg. of PO_4^{---} in 5 cc. of soln. can be detected by means of this reaction: it can be obtained with a single drop of blood, milk, urine, etc., diluted with 5 cc. of water. The reagent which D. has recommended for the detection of Sn is suitable for this work (cf. *Bull. soc. pharm. Bordeaux* 1893, 286; 1896, 45). Mix equal vols. of 10% $(NH_4)_2MoO_4$ with concd. H_2SO_4 . Take 5 cc. of the liquid to be tested for PO_4^{---} and add 0.1 to 10 drops of the acid molybdate soln. according to the probable PO_4^{---} content, mix by shaking, and add 1 or 2 drops of a freshly-prepared Sn^{++} soln. obtained by treating 0.1 g. of Sn foil with 2 cc. of pure HCl soln., and 1 drop of 3% $CuSO_4$ soln., heating till the Sn is all dissolved, diluting to 10 cc. and decanting off the clear soln. when cold. A blue color will be obtained if the soln. tested contains 1 mg. PO_4^{---} per l. A similar reaction is obtained with AsO_4^{---} but the test is only about half as sensitive. W. T. H.

Microchemical reactions of radium; its differentiation from barium by means of iodic acid. G. DENIGÈS. *Compt. rend.* 171, 633-5(1920).—*Procedure:* Take two glass plates; place a droplet (2-4 mm. at the most in diam.) of $RaBr_2$ soln. containing about 3 parts per 1,000 on the one, and a droplet of $BaBr_2$ of equiv. strength on the other. At a very little distance from each of these droplets place similar vols. of 10% iodic acid. Join the drops, using a Pt wire. Feathery crystals of the monoclinic system are formed in both cases. Cf. C. A. 14, 3207. They cannot be distinguished one from the other even at great magnifications. If now, diln. is increased five- or even ten-fold, i. e., 0.30 parts per 1,000, the crystals of the two salts are seen to be entirely different. Drawings are given for the two dilutions. The difference in crystal form suggests the study of a new method of sepn. of Ba and Ra. A mg. of $RaBr_2$ was used in the expts. A. J. SALATRE

A confirmatory test for magnesium. F. EISENLOHR. *Ber.* 53, 1476-7(1920); cf. Vogel, "Praktische Spektralanalyse" 197-200(1899).—The microscopic identification of $MgNH_4PO_4$ frequently fails, not only because the crystals have different forms under different conditions, but also because crystn. frequently fails altogether. If to 5 cc. of the colored soln. of alkanna root (alkannin) in 96% alc., 1 drop of 2 N $(NH_4)_2CO_3$ soln. is added, no change in color is observed, but the addition of 1 drop of neutral solns. of Mg, Ba, Ca, Sr and Mn salts gives, resp., blue-violet, unchanged, blue, blue-violet, blue-violet; Mg^{++} , Sr^{++} and Mn^{++} are not distinguishable. But, if the solns. are acidified with one drop (at the most two) of 2 N HCl (ppt. bright red) and are then treated with the same no. of drops of 2 N $(NH_4)_2CO_3$, then, if Mg^{++} is present the previous blue-violet color returns. If the pptd. $MgNH_4PO_4$ is under examn., it is dissolved in 2 N HCl and a drop of the soln. is added to the alc. alkanna soln.; then 1 or 2 drops of $(NH_4)_2CO_3$ are added to the blue-violet stage, indicating Mg^{++} , whereas in its absence, the original tint of the alkanna persists. It is especially important

for the test that an alc. soln. of the dye, undild. by water, be employed, otherwise the $(\text{NH}_4)_2\text{CO}_3$ is hydrolyzed and the NH_3 gives a blue coloration in all cases.

A. J. SALATHE

The determination of traces of bromine in organic substances. A. DAMBENS. *Compt. rend.* 171, 799–802(1920).—The method permits the estn. of as little as 0.005 mg. of Br in 10 cc. of soln. Dry the substance, which in the toxicological examn. of organs may weigh as much as 60 g., at 100° adding a little KOH in some cases. Mix the dry substance with 5 pts. KNO_3 and 10 pts. Na_2CO_3 and heat slowly in a Ag crucible, but without fusing. Extract with water and filter after 24 hrs. Divide the soln. into 2 parts, A to test for I and B to test for Br and Cl. To A add an excess of AgNO_3 and allow to stand for 24 hrs. in the dark. Filter, wash and suspend the ppt. in 10 cc. of water. Introduce Cl for 15 min. in the cold, add 1 cc. H_2SO_4 and continue to pass Cl through the soln., which is now heated to 100° . After 5 min. at this temp., drive out the excess Cl by air. Centrifuge and add to the aq. soln. a few drops of H_2SO_4 , 2 cc. of CHCl_3 and a little NaNO_3 soln. Det. the I content colorimetrically if less than 0.5 mg. is present or by titration with $\text{Na}_2\text{S}_2\text{O}_3$ if more is present. Neutralize B with HNO_3 , adding 1 cc. in excess and add 0.1 N AgNO_3 in excess. Boil 10 min., heat on the steam bath for 3 hrs. and let stand till the next day. Filter and wash the ppt. Suspend it in 3–4 cc. of water and treat with 3 drops of H_2SO_4 and a fragment of Zn. (1) If less than 0.1 mg. of I was found, filter off the reduced Ag and dil. the filtrate to 10 cc. in a test-tube. Test for Br by the reaction of Denigès and Chelle (*C. A.* 7, 746). (2) If more than 1 mg. of I was found, repeat the treatment of the Ag ppt. with Zn 3 times. Neutralize the filtrate with NH_4OH , add 1 g. of Fe alum and distil until only 10 cc. of liquid is left. In this det. the I by the reaction of Denigès and Chelle. To det. the Cl: (1) If no I was found, dissolve the Zn left by the above reduction of the Ag salts in H_2SO_4 . Filter off the undissolved Ag and calcine the filter and its contents together with the original filter used after the Zn reduction. From the wt. of the Ag, and the known Br content, det. the Cl. (2) If a positive test for I was obtained, det. the Ag volumetrically by the Volhard method, or gravimetrically, in the filtrate from the original treatment with 0.1 N AgNO_3 .

W. T. H.

Three lecture experiments (test for arsenic) (PEREIRA) 2. Assaying gold (report of the work of the Egyptian government laboratory, etc.) (LUCAS) 13.

BRADLEY, THEODOR J.: A Laboratory Manual of Qualitative Chemical Analysis for Students of Pharmacy. Philadelphia: Lea & Fabiger. 136 pp.

RÜSBERG, F.: Einführung in die analytische Chemie. 1 Teil. Theorie und Gang der Analyse. 94 pp. 2 Teil. Die Reaktionen. 105 pp. Leipzig and Berlin: B. G. Teubner. M. 2.80, bound M. 3.50. For review see *Z. Zuckerind. czechoslov. Rep.* 45, 45(1920), or *Deut. Zuckerind.* 45, 558(1920).

Determining the methane in mine air or the concentration of a gas mixture. H. RINGGER. *Cer.* 301,700, Apr. 24, 1914. Gas or gas mixt. under examn. is brought into contact with a wire through which an elec. current is passing, and the resulting temp. and resistance changes due to the heat cond. of the gas or gases are indicated by a suitable instrument. For the purpose of measuring or indicating, that high cond. is used which is produced by the dissociation of the methane or the like occurring at a definite elevated temp.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND W. F. HUNT

Flint problems. C. CARUS-WILSON. *Geol. Mag.* 57, 474-5(1920).—A number of English flints are described, and attention is called to problems of their origin.

S. G. GORDON

A new member of the spinel group, chromohercynite, from Madagascar. A. LACROIX. *Bull. soc. franc. min.* 43, 69-70(1920).—This mineral is found associated with magnetite in granular masses in gneisses and cryst. schists. It has a black vitreous luster and a sp. gr. of 4.415. It is an isomorphous mixt. of chromite and hercynite in equimol. proportions. $\text{Cr}_2\text{O}_3:\text{FeO}:\text{Al}_2\text{O}_3(\text{Fe,Mg,Mn})\text{O} = 1:1$. Analysis gave: $\text{Cr}_2\text{O}_3 = 38.64$, $\text{Al}_2\text{O}_3 = 27.12$, $\text{Fe}_2\text{O}_3 = 0.61$, $\text{FeO} = 27.00$, $\text{MnO} = 1.10$, $\text{MgO} = 5.33$, $\text{SiO}_2 = 0.28$, $\text{H}_2\text{O} = 0.25$.

C. B. SLAWSON

The spar mine at Helgustadir, Iceland. H. H. EIRIKSSON. *Trans. Inst. Mining Eng. (London)* 59, 56-63(1920); *Mineralog. Abstr.* 1, 78(1920).—The mine visited in 1919 is an open pit 100 by 72 ft. with a depth of about 50 ft. It had not been worked since 1914. The larger crystals are found embedded in a clay which fills the crevices of a basaltic mass. The local distribution of the Iceland spar suggests its deposition from hot underground waters.

W. F. H.

A crystallographic study of calcite and barite from Langbanshyttan. G. AMINOFF. *Geol. Förh.* 40, 273-446(1918); appendix 1, fluorite, 436-40; appendix 2, tilasite, 441-4; *Mineralog. Abstr.* 1, (1920).—Sixteen types of calcite crystals showed 78 forms, of which 24 are new. The minerals associated with each type and order of crystn., curvature of faces, corrosion and growth phenomena, and influence of original soln. on the habit of crystals are also discussed. The barite crystals were of 7 types, and 2 new forms were recorded. On fluorite and tilasite 3 new forms each were noted.

W. F. H.

A contribution to the study of the optical properties of cerussite. P. SEVE. *Bull. soc. franc. min.* 43, 9-22(1920).—The interference figures produced by violet and ultra-violet rays are studied by photographic methods. For a wave length of 360μ the optic angle is 16° and the plane of the optic axes crosses that normally obtained.

C. B. SLAWSON

The identity of iochroite and tourmaline. A. LACROIX. *Bull. soc. franc. min.* 41, 130-1(1918); *Mineralog. Abstr.* 1, 74(1920).—The optical properties of iochroite from Esbo, Finland, agree with those of tourmaline, and the V content (V_2O_5 7.53%) originally reported may be erroneous.

W. F. H.

Flagstaffite, a new mineral from Arizona. F. N. GUILD. *Univ. Ariz. Am. Mineral.* 5, 169-72(1920).—In pine logs, buried 500 or more years ago, a cryst. mineral was observed. It is soft, and melts at $99-105.5^\circ$, subliming at this temp. It is sol. in EtOH and benzene, less sol. in Et₂O and insol. in H₂O. The mean n is 1.510, and the d 1.092. Crystn. is orthorhombic, with $a:b:c = 1.2366:1:0.5951$, and 5 forms. Analysis gave the empirical formula $\text{C}_6\text{H}_3\text{O}$, but mol. wt. detn. by the b. p. method gave 210 ± 7 , indicating the tripled formula $\text{C}_{18}\text{H}_9\text{O}_3$ (theory 216). The nearest previously known substance is colophonin, $\text{C}_{18}\text{H}_{22}\text{O}_4$, but that differs widely in properties. The name flagstaffite is given from the town Flagstaff, Arizona, near which it was found.

E. T. W.

Minerals from the old tungsten mine at Long Hill in Trumbull, Connecticut. EARL V. SHANNON. *Proc. U. S. Nat. Mus.* 58, 469-82(1920).—Scheelite and wolframite formerly occurred in this mine, the latter only as pseudomorphs after the former. Such specimens are not now obtainable at the mine. A brief description is given of marcasite, sphalerite, garnet, pyroxene, fluorite, and topaz, and many other minerals

are mentioned. Chemical compn. and *ns.* are shown in the following table for (I) prochlorite, (II) epidote, (III) margarodite, (IV) margarite, (V) scapolite:

	I	II	III	IV	V
SiO ₂	23.69	36.89	46.88	33.72	51.38
Al ₂ O ₃	21.26	28.50	36.42	50.27	25.22
Fe ₂ O ₃.....	...	5.92	1.98	0.66	...
FeO.....	26.52	0.52	0.82	tr.	...
MgO.....	17.60	0.21	1.36	0.47	0.73
CaO.....	3.32	27.26	1.77	10.48	15.16
MnO.....	0.43	0.02	tr.	tr.	tr.
Na ₂ O.....	...	...	0.38	0.74	2.86
K ₂ O.....	...	...	6.24	1.64	1.20
H ₂ O.....	7.63	1.29	4.03	1.90	0.55
F.....	...	0.60	n. d.	0.14	2.74
Cl.....	...	...	...	...	1.98
Sum.....	100.45	101.21	99.88	100.02	101.82
α =	1.621	1.706	1.549	1.620	ω = 1.553
β =	1.618	1.710	1.579	1.629	ϵ = 1.540
γ =	1.618	1.720	1.590	1.630	

L. W. RIGGS

Minerals hitherto unknown in Derbyshire. C. S. GARNETT. *Nature* 106, 148 (1920).—The occurrence of the following minerals in Derbyshire is noted: zaraitite, nephrite (jade), diabantite, cimolite, allophane, utahite(?), S, and wad.

S. G. GORDON

Notes on the meteorite of Estherville, Iowa, with especial reference to its included "peckhamite" and probable metamorphic nature. GEORGE P. MERRILL. *Proc. U. S. Nat. Mus.* 58, 363-70(1920).—Differing analyses of a mineral of this meteorite, called peckhamite by J. L. Smith and chassignite by Shepard, led to a microscopical re-examination by M. and a new chem. analysis by Shannon. The results of these studies indicate that the Estherville meteorite is a "product of metamorphism,—a stone originally consisting of fragments of the various silicates, pyroxene, anorthite, olivine, feldspars, and enstatite, which have been subjected to such compression, heating, and reducing vapors as to render the more finely disintegrated material holocrystalline." Incidentally it has become impregnated with Fe resulting from the reduction of some preëxisting ferrous mineral.

L. W. RIGGS

Recent accessions in the division of applied geology. EARL V. SHANNON. *Proc. U. S. Nat. Mus.* 58, 323-6(1920).—War conditions greatly stimulated the mining industries, particularly in connection with the production of W, Mo, V, Cr and Ti. Among the specimens described are scheelite from Cal. and Nev., wolframite from Japan, Bolivia and U. S., ferberite, hübnerite, and tungstenite. This series of W ores is perhaps the finest in the world and contains the types described by Hess (*C. A.* 11, 3211). New specimens of Mo and V minerals, mostly from U. S. localities, are noted. Remarkable specimens of NaCl and Na₂SO₄ are from Chile, also KCl and NaCl from Alsace. Extensive series of Australian, Brazilian and Japanese ores have recently been acquired.

L. W. RIGGS

Vein filling at Bendigo, Victoria. WALDEMAR LINDGREN. *Econ. Geol.* 15, 312-4 (1920).—L. presents a photograph and description of a specimen from a dump of the New Chum reef line. The opening is believed to be due solely to a bulging of the slate layers. The sides of the vein are coated with a thin layer of ankerite, the rest of the vein being filled with quartz. No perceptible alteration of the slate is apparent except a few pyrite crystals. Apparently isolated fragments of slate prove, upon exam-

ination, to be attached to the main rock wall. The quartz has corroded the ankerite only slightly, indicating rapid filling. The conclusion is reached that the opening was not due to the force of the crystn. of the quartz, as has been previously contended in the case of veins of this locality, but rather the opening was formed through other stresses to which the slate was subjected, remained open long enough for the lining of ankerite to be deposited, and then with changing solns., the vein was completely filled with quartz.

A. B. PECK

The iron-ore supplies of the world. F. H. HATCH. *Geol. Mag.* 57, 504-17(1920).—The Fe ore reserves of the U. S., Cuba, Newfoundland, Brazil, Scandinavia, central Europe, the United Kingdom, Spain, and northern Africa total 30,300 million tons. Another 1,500 million tons should be added for the small deposits of Russia, Austria, Greece, Chile, Venezuela, Mexico and Canada. The resources of Africa, Asia, and Australia are unknown, but may be theoretically estd. at 52,200 million tons.

S. G. GORDON

The development of iron ore in Great Britain during the war. F. H. HATCH. *Econ. Geol.* 15, 328-38(1920).—A review of the difficulties met and overcome in the way of opening up mines, quarries for limestone and dolomite, and the obtaining of magnesite from Greece to replace that of Austria for refractory linings. The ores used are Jurassic ironstones, lean in Fe (22.7-33%), but widely distributed and easily accessible for the most part. Other non-Jurassic ores are also used. When present plans, initiated during the war, are completed it is believed that no importation of steel will be necessary. Analyses of the principal ironstones are given.

A. B. PECK

Preliminary notes on the geology of the Ningi Hills, Northern Nigeria. GERRARD W. WILLIAMS. Petrographical appendix, R. H. RASTALL. *Geol. Mag.* 57, 424-47(1920).—The rocks of the area comprize a series of gneisses, Na-rich granites, syenites, gabbros, rhyolites and porphyries of Archean and Mesozoic age. Sn occurs in the riebeckite-granite and in streams cutting such areas.

S. G. GORDON

The Chilean nitrate deposits. W. L. WHITEHEAD. *Econ. Geol.* 15, 187-229(1920).—A description of the geology and physiography of the nitrate region is followed by descriptions of the vertical distribution of the salts of the deposits and their relations to the topography and rocks. The former theory of the concn. of the nitrate based on capillary action is rejected as insufficient to account for conditions except at one special point and in its place is developed a theory based on concn. by superficial intermittent waters due to fog, dew, or cloudburst during the development of the present desert topography, thus causing slow downward migration of the salts. Relative to the origin of the nitrate, the seaweed, guano, and bacterial nitrogen fixation theories are considered unsupported by geologic evidence or inadequate. A theory of volcanic origin is advanced based on the oxidation of NH_3 and NH_4 salts deposited in tuffs and later oxidized to HNO_3 during the erosion of the tuffs. Such origin also gives support to the present facts of salt association and occurrence and distribution of the deposits. Analyses of typical ore material and an extensive bibliography are given. A. B. P.

Kaolin in North Carolina, with a brief note on hydromica. W. S. BAYLEY. *Econ. Geol.* 15, 235-46(1920).—The kaolins are found in pegmatite veins in the mountain regions and as blanket deposits derived from broad areas of igneous or metamorphic rocks in the Piedmont plateau. The downward gradation of the kaolin into pure feldspar in the pegmatite veins and retention of the characteristic texture of the pegmatite show that the kaolin occupies the place of the feldspar in the original pegmatite. Of the 3 generally accepted kaolinization processes of feldspar, it is believed that the true one in this case is downward traveling H_2O bearing dissolved CO_2 and org. matter along feldspathic dikes. The alteration of minerals other than feldspar includes soln. of quartz in some cases, possibly by alkalis. Beryl changes to scaly mica and kaolin.

Biotite, hornblende, tourmaline, and other ferruginous minerals have altered to chlorite and hydrated micaceous minerals, limonite, and other Fe oxides, and to an Fe carbonate. A good specimen of so-called "hydromica" gives unsatisfactory and generally indefinite optical and chemical data and is believed to represent an aggregate of fine-grained decompn. products embedded in a matrix containing residual muscovite. Owing to water and increasing feldspar content the dikes cannot usually be worked for kaolin to a greater depth than 95 feet. Analyses of feldspars, kaolins, and hydromica are given.

A. B. PECK

Carbon ratios in Carboniferous coals of Oklahoma, and their relation to petroleum. MYRON L. FULLER. *Econ. Geol.* 15, 225-35(1920).—A discussion for Okla. along lines similar to a previous paper on the Texas coals (cf. *C. A.* 14, 514). The general relations of C ratio to depth, unconformities, and structure, are discussed. C ratios for Okla. are given for various areas and mapped and discussed. Finally the prospects for oil in different Okla. areas are briefly considered.

A. B. PECK

Notes on the coal industry of northeastern France, Belgium, the Saar, and Westphalia, 1904-1913. H. F. CROOKS. *Econ. Geol.* 15, 277-311(1920).—C. discusses the geological formation and distribution of the coals of each area. Many data are given concerning the character, output, costs, chem. compn., thermal values, coking qualities, and reserves of each district. In general, the conclusion is reached that even with acquisition of the Saar fields, because of the better coking quality of Westphalian coal, France will still be compelled to rely on the latter coal for most of the coke for its metallurgical industry, perhaps exchanging Lorraine ore for coke. A rather extensive bibliography is appended.

A. B. PECK

Geologic and economic features of oil structures. VICTOR ZIEGLER. *Econ. Geol.* 15, 247-58(1920).—Theoretical consideration of the geologic features shows that max. accumulation is favored by a comparatively recent age of the formations, slight folding closely following the period of deposition, and rock originally rich in organic remains. Economic considerations discussed are depth of drilling, possible value of production, accessibility, transportation facilities, operating requirements, and legal status of lands.

A. B. PECK

The existence of diamond-bearing "pipes" in Brazil. ROBERT R. WALLS. *Geol. Mag.* 57, 447-9(1920).—The diamond mine at Sopa lies in a sericite schist crowded with Fe ore and diamonds. The sericite schist is surrounded by quartzites, and is believed by the writer to represent a metamorphosed igneous intrusive.

S. G. GORDON

A test of the feldspar method for the determination of the origin of metamorphic rocks. CHARLES G. CARLSON. *J. Geology* 28, 632-42(1920).—An attempt is made to test the theory that metamorphic rocks with a narrow range of feldspar compn. are of igneous origin, while those showing a wide range of feldspar are of a sedimentary source. (Cf. *C. A.* 14, 2903.) This involved a study of the range of the compn. of feldspars in both unconsolidated and consolidated sediments, also a study of metamorphic rocks of known igneous and sedimentary origin. For the detn. of the feldspars both the Fouqué and Becke methods were employed. Orthoclase, microcline and the acid plagioclases are more abundant in sediments than are the basic feldspars, the latter suffering more rapid decompn. It was found that anamorphism does not cause any decided change in the compn. of the original unmetamorphosed feldspar. The 36 samples recorded reveal this method to be of unusual aid in determining origin, especially in conjunction with field relations and chem. evidence.

W. F. H.

Series of alkaline potassic syenitic rocks with sodium minerals in Madagascar. A. LACROIX. *Compt. rend.* 171, 594-600(1920).—Eighteen analyses by Raoult of these rocks are quoted, and their lithologic relations discussed at length.

L. W. RIGGS

The metamorphism of the Pre-Cambrian dolomites of southern Eyre Peninsula, South Australia. C. E. TILLY. *Geol. Mag.* 57, 449-62; 492-500(1920).—A series of sedimentary rocks, including dolomites, was invaded and metamorphosed by later gneisses and granites, with the development of forsterite marble, diopside rock, and diopside-microcline rocks. The forsterite marble originated by residuary crystn. alone. The diopside rocks were formed by the addition of SiO_2 solns. from the granites after normal residuary crystn.

S. G. GORDON

The Katmai region, Alaska, and the great eruption of 1912. CLARENCE N. FENNER. *J. Geology* 28, 569-606(1920).—A preliminary report, chiefly of geological character, of the expedition to Katmai undertaken in the summer of 1919. The volcanoes are situated in an area of sedimentary rocks free of folding and visible faulting. The previous lavas were andesitic, and contrast sharply with the siliceous rhyolite of the last eruption. The injection of a sill into the underlying strata is believed to have shattered the rocks, permitting the lava to ascend. The disappearance of Mount Katmai with the subsequent formation of the large crater pit is explained by the collapse of the walls and incorporation of the material in the new magma. Material which has been previously called a mud flow is shown to be a deposit of dry, highly heated, volcanic ash.

W. F. H.

Glass manufacture and the glass sand industry of Penn. (PETTKE) 19. The mechanics of solidity (INNES) 2. Prospecting for petroleum and gas in Italy (LORTI) 22. The existence of binding rings in diamond (KOLKMEIJER) 2.

GRABAU, AMADEUS W.: *Geology of the Non-metallic Mineral Deposits other than Silicates. Vol. I. The Principles of Salt Deposition.* New York: McGraw-Hill Book Co. 434 pp. \$5.

9—METALLURGY AND METALLOGRAPHY

WILLIAM BRADY, ROBERT S. WILLIAMS

The mechanism of the surface phenomena of flotation. IRVING LANGMUIR. *Trans. Faraday Soc.* 15, Pt. 3, 62-74(1920).—The surface phenomena of flotation may be divided into 3 classes, the formation and properties of the froth, the oiling of the solid particles and the adhesion of the oiled particles to the bubbles of the froth. The formation of a froth depends on the existence of a film of oil or other substance at the boundary between the air and water phase. The adhesion of the particles to the bubbles depends primarily on the ease with which oily water wets the oily solid and this in turn is measured by the angle of contact between the oiled liquid and the solid surfaces. According to the monomolecular theory of adsorption layers previously developed by L. the formation of oil films on water and hence froth formation depends on the presence in the oil mol. of groups having great affinity for water as $-\text{COOH}$, $=\text{CO}$, $-\text{OH}$. Thus oleic acid spreads on water while paraffin hydrocarbons do not. The oil mols. are not spheres, but have a shape corresponding in general with their structural formulas; they are oriented on a water surface with their polar groups toward the water. Similarly sol. substances are oriented in the surface of a soln. Expts. are given to show the considerable effect of oiling the surface on the contact angles of mica, quartz, glass, Pt, calcite, sphalerite and galena.

R. S. DEAN

Pure metallic arsenic. CHESTER H. JONES. *Chem. Met. Eng.* 23, 957-60(1920).—To meet the demand of metallic As in the U. S. of 50,000 lbs. per year, formerly imported from Germany, the Hoskins Process & Development Co. has developed a process, based on reduction of As_2O_3 with wood charcoal, which produces metallic As with

a purity of 99.5%. The As_2O_3 is obtained from material recovered by Cottrell precipitators from smelter fumes. J. describes a battery of 4 reduction furnaces producing 300 lbs. metal per day. Furnaces are built with large steel pipes insulated with fire brick and supported on a pipe framework. The cover on the charging end is clamped against a clay gasket containing a small Cu cooling coil which condenses leaking As fumes. At the rear of the furnace is a T-shaped condenser, water-cooled, in which the As is collected and removed at the end of run. The charge is made up of a mixt. of 200 lbs. of material containing 1 pt. wood charcoal and 4 pts. As_2O_3 . The furnace is heated by gas to 1200° – 1300° F. for 10 hrs. Proper ventilation is provided and operators wear woolen masks to prevent poisoning from fumes. The phys. and chem. properties of As are reviewed. Uses for As are in As bronze; to increase tensile strength, rigidity, hardness and resistance to gases in locomotive firebox alloys; to increase fluidity of brass; to give mobility in casting Pb shot and in manuf. of speculum metal.

E. S. WHITTIER

Safe practices in blast furnace operation. L. A. TOUZALIN. *Iron Age* 106, 971–2(1920).—Safeguards used to minimize industrial hazards of blast furnace operation at South Works, Illinois Steel Co., are discussed. Greatest danger is in gas leaks, especially where gas is shut off by a water seal only. All water seals should be protected by a plate or goggle valve. The use of gas helmets is proving very satisfactory. A suitable CO detector would prove valuable. Devices such as the Bates cinder notch stopper, Berg automatic mud gun and Mullin tapping machine are used to counteract hazards of metal and cinder burns.

O. A. H.

Selecting a slag and apportioning slag losses. C. A. GRABILL. *Eng. Mining J.* 110, 569–72(1920).—A method is given for calcg. slag and mat compn. from a given charge in a Cu blast furnace. Methods of computing various items in smelting costs are also given, particularly methods of charging for Cu loss in the slag. It is recommended that this loss be charged on the basis of the iron contents of the slag.

A. BUTTS

Slag formation and magnesite consumption in the basic Martin process. OTAKAR QUADRAT. *Chem. Listy* 14, 38–40(1920).—Q. detd. the amt. of slag formed from the quantities of lime and limestone used. A close agreement with actual results was obtained by calcg. the wt. of the slag formed from its largest percentage components. The amt. of magnesite dissolved by the slag from the furnace lining was detd. by analysis of the slag. If the lime and limestone used had been of such purity that their MgO content could have been considered negligible, then the amt. of slag obtained would have been directly proportional to the charged lime and limestone. The limestone used in these tests was greatly contaminated with dolomite and therefore the MgO had to be considered in the calculations. The amt. of magnesite used in the basic Martin process was found to fluctuate between 0.27 and 1.79 kg. per 100 kg. of finished material. The amt. of slag formed varied between 13.5 and 16% for soft material. For steel it was 9.6%. It was found that from the total amt. in the charge 0.9–1.89% of the Fe, 60–83% Mn, 69–89% P, and 42–60% S went into the slag. In the manuf. of Fe 94–95% of the total C was burned. In the process for making steel (with 0.67% C) 59.3% was burned. The yield obtained in the process equaled 94.3–94.6%. 34–57% of the SiO_2 in the slag came from the furnace lining and from accidental impurities.

JOHN M. KREW

Milling practice at the Benguet Consolidated Mines. I. C. M. EYE AND M. F. DODD. *Mining and Sci. Press* 121, 805–10(1920).—A description is given of the first plant, built in 1905. A new mill was built in 1915. Details and a diagram of the flow-sheet are given, which includes a jaw crusher, 10 stamps, 6×8 and 6×10 ft. tube mills, 3 Dorr classifiers, two 30-ft. primary and 3 25-ft. secondary Dorr thickeners, 3 Dorr and 1 Trent agitators, 3 24-ft. Trent replacers, 12×18 ft. Oliver filter, tailings

thickener, trommel, zinc boxes and pumps. The filter has a capacity of 140 tons per day and delivers a cake containing 25% moisture. One lb. of cyanide per ton of soln. is used; it is added at head of ball mill. The ore treated is a mixt. of quartz, iron oxide and sulfide, altered diorite and clay. Iron sulfide exceeds the oxide. \$20 ore is treated, upon which a 90% recovery is made, losses being mainly due to gold and silver tied up as tellurides. II. *Ibid* 841-6.—The ore from the mine, after passing through the crushing plant, is elevated to a wash trommel, the coarse material going to stamps, then to roughing classifiers, the coarse product of which goes to two tube mills. The fines from the trommel go to a Dorr classifier, the coarse of which goes to the tube mills, and the fines to secondary classifiers, working in closed circuit with the tube mills. The product from these classifiers, containing 5% plus 100 mesh, and having 60% of the gold dissolved, is elevated to a primary thickener, the thickened product of which goes to a Trent agitator, and then into another thickener. The overflow of both thickeners goes to clarifiers, thence to the zinc boxes. The first thickener furnishes 75% of the flow to the zinc boxes. Second and third agitations are carried on with Dorr agitators, in connector with four secondary Dorr thickeners. This is followed by three Trent replacers, then a final thickener ahead of the Oliver filter. Cleanups from zinc boxes are made bi-monthly, and the product refined in oil furnaces equipped with graphite pots. A good detailed description of their present practice is given, with troubles and difficulties that have been encountered, and methods employed and changes made to overcome them.

A. H. HELLER

Automatic conveyor furnace. *Iron Age* 106, 642(1920).—Brief description and drawing are given showing a new type of conveyor furnace in which hearth does not leave the furnace, thus minimizing heat loss. By means of a system of movable beams, consisting of refractory blocks, and pusher rams, it is possible to move material being treated vertically or horizontally through the furnace at will. Independent beams can be designed to handle work of varying shapes. Horizontal movement through the furnace is effected by crank link motion. By changing the eccentricity of the link the speed of movement can be regulated. Conveying mechanism is offered particularly in heating such work as crank and cam shafts, axles, frames, bars, tubes, etc.

H. C. PARISH

A new heat-treating furnace. *ANON. Iron Age* 106, 644(1920).—A description and drawing are given of a new type of heat-treating furnace recently placed on the market by Advance Furnace & Eng. Co., Springfield, Mass. Features are automatic moving floor, air-operated, and preheating chamber. This chamber utilizes waste gases of heating chamber. After passing through the heating chamber the work is automatically dumped into a quenching tank. Absence of motor drives with reduction gearing is considered an advantage. The furnaces are made for gas or oil.

H. C. PARISH

New oven secures uniform anneal. *ANON. Foundry* 48, 769-71(1920).—A new annealing furnace designed by John Jordan, of the Arcade Malleable Iron Co., gives remarkable uniformity of temp. at all points and effects considerable economy in coal consumption. The novel feature of this furnace is the construction of fireboxes inside the annealing oven proper. The hot gases pass over the annealing pots and through flues in the floor of the oven. The paper is illustrated.

O. A. H.

Scientific studies of non-ferrous alloys. C. T. HEYCOCK. *Nature* 106, 60-2 (1920); *Sci. Monthly*, 11, 303-8(1920).—A discourse.

W. H. ROSS

Molding sands, chemically and mechanically. *ANON. Brass World* 16, 318-20 (1920).—A review.

C. G. F.

The constitution of the iron-nickel alloys. D. HANSON AND HILDA E. HANSON. *Iron and Steel Inst.*, Sept. (1920); advanced proof, 20 pp.—The paper describes an investigation into the constitution of the Ni-Fe alloys. Special attention is given to the

detn. of the effect of small quantities of Ni on the critical points of pure Fe and an examn. of Osmond's theory of the Ni-Fe alloys and the detn. of the "stable" diagram of the Ni-Fe alloys. The effect of Ni in widening the critical range was noted. In spite of the fact that the lowest possible rates of cooling were adopted (900° to 350° over a period of nearly 1000 hrs.) the transformation extends over a temp. range of 200° in the 6% Ni alloy. The upper limit of the critical range, as detd. microscopically, for alloys containing low percentages of Ni, agreed very closely with the transformation line detd. by thermal curves. Photomicrographs and an equil. diagram for the alloys are given.

V. O. HOMERBERG

Graphitization of iron-carbon alloys. KÔTARÔ HONDA AND TAKEJIRO MURAKAMI. *Iron and Steel Inst.* Sept.(1920); advanced proof, 8 pp.—In pure Fe-C alloys, graphitization is caused by the decompn. of the cementite solidified during cooling from the melt. Graphitization is not a direct decompn. of cementite at high temp. according to the equation $\text{Fe}_3\text{C} = 3\text{Fe} + \text{C}$, but it is caused by a catalytic action of CO or CO_2 . In the investigation, the influence of the following factors was studied: (1) the max. temp. of the melt and the time exposure at this temp.; (2) the effect of the mode of cooling; (3) the effect of special treatment during melting; (4) the effect of previous treatments; (5) the annealing below eutectic point.

V. O. HOMERBERG

Casting and molding steel ingots. EMIL GATHMANN. *Mining and Met.* 164, 29-31(1920); cf. C. A. 13, 2175.—G. discusses effervescing or gassy steel, also termed evolution steel, and non-effervescing or killed steel, also termed sol. steel. The best results, as to freedom from surface blowholes, snakes, etc., in evolution steels are obtained when the ingots are bottom-cast. Similar results as to deep seating of blowholes and freedom from snakes have been obtained in division B steel by means of what may be called top-bottom casting; that is, employing a special teeming or pouring nozzle whereby the pressure and velocity of liquid steel as it enters the mold is greatly reduced without, however, reducing the quantity or vol. per min. of steel teemed.

V. O. HOMERBERG

Rates of reaction in certain steels at 930°. E. D. CAMPBELL AND B. A. SOULE. *Iron and Steel Inst.* Sept.(1920); advanced proof, 6 pp.—Five steels were selected for the work. A was a hyper-eutectoid nearly pure Fe-C alloy made by carburizing ingot Fe. This steel was selected in order to eliminate as far as possible the influence of elements other than C. B was a high-Si transformer steel. C was a basic open-hearth 5% Ni steel. D was a com. Mn steel. E was a hypo-eutectoid Mn steel resulting from the decarburization, by means of H, of steel D. The difference in the rate of cooling of the 2 ends of a bar produced changes in chem. constitution which resulted in differences in thermoelectromotive potential much in excess of anything attributable to exptl. error. In all of the freshly quenched steels, section 15 (a bar was divided into 15 sections and placed in an oil bath in such a manner that section 15 was in contact with the electrolytic Fe, thus constituting the hot junction), on account of the more rapid rate of cooling, had a higher thermoelectromotive potential than section 1 (the position of the bar was reversed so that section 1 was made part of the hot junction). In the C steel A the difference in potential at the opposite ends of the bar indicated a difference in chem. constitution approx. equal to 8% of that due to tempering at 110° and about 3% of that due to the total carbide concn. In steels like B, C, D and E, having a third element whose thermoelectromotive potential is higher than that which would be due to carbides alone, the effect of pptg. carbides by tempering at 110° was to increase the thermoelectromotive potential.

V. O. HOMERBERG

Electric steels. C. G. CARLISLE. *Iron and Steel Inst.* Sept.(1920); advanced proof, 23 pp.—It is for the most part the ability and art of the furnaceman in controll his slags so as to obtain liquidity and correct thickness over the whole area of the throughout the charge, and more especially during the refining period, that open-

whether or not sound metal is produced. As a result of 5 or 10 min. neglect of the slag, the metal often will be converted from sound to unsound material, as it becomes uncovered owing to the slag losing fusibility. In a series of compression tests it was found that high-W steels give a high yield point and generally avoid breakdown up to 180 to 190 tons. Salt-bath heating, prior to hardening, increases the power of resistance, giving less set; final collapse at 200 tons pressure is also avoided. No difference in set is obtained with load applied in the direction of rolling and when applied at right angles to it. With gas-furnace heating of samples, the elec. steel remains sound with 200 tons pressure, whereas the crucible steel crushes with loads of 190 and 199 tons, resp. The mean yield point of the crucible steel is 105 tons, of the elec., 112.5 tons. Further tests showed that the elec. steel tool was superior to the crucible steel. With a correct slag, killing agents are not necessary. Steel can be made sound in the elec. furnace, heat after heat, no Al whatever being required, while an incorrect slag and its consequences cannot be remedied by adding Al to the ladles. This is a distinction peculiar to the elec. furnace.

V. O. HOMERBERG

Gases occluded in steel. J. W. DONALDSON. *Trans. Faraday Soc.* 15, Pt. 3, 238-44(1920).—A 3.37% Ni steel and 3 mild steels were examd. The results showed that the vols. of the gases dissolved by the various steels are much higher than those dissolved by similar alloy steels of approx. the same C content prepd. by similar processes and undergoing similar treatment. They are also considerably higher than vols. obtained by other investigators. The occluded gases are of a nature similar to those of other C steels which have been examd. at various times. CO is present in small quantity at low temp., but increases as the temp. increases, attaining a max. in each case between 670° and 700°. H predominates at low temps., decreases to a min., then increases. Both gases are present in approx. equal proportions at high temps. The largest vols. of gas are evolved in the neighborhood of the critical ranges, especially at the A_1 point. In this respect they agreed with other steels which had been examd.

V. O. HOMERBERG

Formation of spheroidal cementite. KÔTARÔ HÔNDA AND SHÔZÔ SAITÔ. *Iron and Steel Inst.* Sept.(1920), advanced copy, 7 pp.—If a quenched specimen be heated to below A_1 point, sorbitic cementite spheroidizes. If a hyper-eutectoid steel be heated above A_1 point, but below the soly. line, and quenched, the spheroidization of the hyper-eutectoid cementite takes place. If a lamellar pearlitic steel be heated to just the A_1 point or a little above this point, for a certain interval of time, spheroidization takes place. Granular pearlite spheroidizes by being heated below the A_1 point for a sufficiently long interval of time. If the A_1 point be not reached the spheroidization of lamellar cementite can never proceed. If the max. temp. exceeds a certain limit above the A_1 point and the steel be then cooled, cementite appears as a lamellar pearlite. The temp. interval of spheroidization in low-C steels is very small, extending only to about 20°; it increases rapidly with the C content. In very high-C steels the interval amounts to about 100°.

V. O. HOMERBERG

Experiments on deoxidation of steel with hydrogen. J. H. WHITELY. *Iron and Steel Inst.* Sept.(1920), advanced copy, 14 pp.—Owing to the failure to remove the banded structure in a section of a steel plate by heating it in dry H₂ for several hrs. at temperatures below 950°, the proof that this structure is due to dissolved oxide was not obtained. In order to get an idea of the speed at which oxide can be reduced in the metal, the action of H on visible particles of oxide was investigated. The investigation was carried out with a sample of Armco Fe since it contained numerous particles of FeO and Fe oxide-sulfide eutectic. Two series of expts. were made, the first with small section and the second with strips 1/100" thick. The expts. all showed that oxide is removed very slowly below 950°; as the temp. is raised the speed increases. Not until 1300° was used, did the thin strips appear to be completely deoxidized in 1 hr. When

thin turnings were similarly treated, the speed of deoxidation was decidedly quicker, probably because of the numerous cracks and fissures. It was shown that it is possible for one steel to be decarburized and another carburized under the same conditions, in an atm. of H. The expts. served to emphasize the fact that if O, as oxide, is to be correctly detd. in steel, a high temp. of heating (1000 to 1200°) is required; the drillings or turnings should be the finest possible, if a long heating is to be avoided, and the possibility of CO or CO₂ being evolved should not be overlooked. V. O. H.

Solution of metals in acids as related to corrosion (RICHARDSON) 2. A sensitive method of thermal analysis and the transformation points of quartz, of iron and of nickel (PERRIER, WOLFERS) 2. The periodic system of the elements and the mechanical-technologic properties of alloys (GUERTLER) 2. Cadmium poisoning (STEPHENS) 11H.

MARQUAND, H. S.: *Electric Welding, its Theory and Practice, Application and Economics*. London: Benn Bros., Ltd. 204 pp. 12s. 6 d. net. For review see *Electrician* 85, 506(1920).

Mineral flotation. J. P. RUTH, JR. U. S. 1,356,832, Oct. 26. C₆H₆ is used as a frothing agent in the sepn. of minerals.

Ore-flotation separation method. D. F. HALEY. U. S. 1,357,556, Nov. 2. Mechanical features.

Apparatus for flotation separation of minerals. J. ALLINGHAM. U. S. 1,357,921, Nov. 2.

Treating iron ores. PHOENIX AKT.-GES. FÜR BERGBAU UND HÜTTENBETRIEB, ABTEILUNG HOERDER VEREIN. Brit. 148,920, July 10, 1920. Fe ores are subjected to a preliminary heating to drive off H₂O present in the form of moisture or contained hydrates, in order to avoid disintegration during subsequent smelting. The heating may be effected by a current of warm air or gas.

Treating ores. J. SIMON. Brit. 149,247, July 12, 1920. Burnt pyrites, mixed with salt and with not more than 2% of coke breeze is rotated in a shaft furnace in a countercurrent of air. A suitable construction is specified.

Treating copper ores. W. E. GREENAWALT. U. S. 1,357,495, Nov. 2. Cu ore is treated with an acid soln. to dissolve the Cu, rich and lean Cu solns. thus obtained are kept sep. and the rich soln. is electrolyzed so as to oxidize the Fe salts in the soln. and deposit part of the Cu. Cu is pptd. as sulfide from the lean soln., SO₂ is applied to the rich soln. and the soln. is maintained reduced with the Cu sulfide obtained from the lean soln.

Cupola remelting of ferrous metal. H. KOPPERS. U. S. 1,357,780, Nov. 2. In the cupola remelting of Fe or its alloys, a pool of slag is continuously maintained in the hearth of the furnace in the presence of incandescent C which has sunk below the level of the air blast and into the slag pool, and the remelted metal is passed through this slag pool, to effect absorption of S from the metal.

Blast-furnace operation. H. KOPPERS. U. S. 1,357,781, Nov. 2. In desulfurizing Fe or conducting similar operations in a blast furnace, bodies of slag and molten metal are maintained at const. levels at the bottom of the charge, to prevent sudden sinking of the charge, and a portion of the furnace gas is withdrawn between the top gas outlet and the twyers to check fusion in the stack part of the furnace and insure gradual sinking of the charge into the melting zone.

Ore-roasting furnace. E. BRACQ. U. S. 1,356,849, Oct. 26.

Refining steel. STAHLWERKE R. LINDENBERG AKT.-GES., HERAEUS GES., W. C. HANAU. Brit. 148,548, July 10, 1920. The deoxidation and degasification of open-

hearth and converter steel are effected in an elec.-heated mixer at a comparatively low temp. and under reduced pressure.

Manganese steel. W. G. NICHOLS. U. S. 1,356,551, Oct. 26. Mn steel scrap is melted and there is then added to it sufficient Mn ore to bring the ultimate product to the desired content of Mn.

Treating steel of high-explosive shells. R. A. HADFIELD. U. S. 1,357,705, Nov. 2. A shell for high explosives, having a high elastic limit, high tensile strength and high elongation is obtained by the following method: A Ni-Cr steel ingot or blank containing about 0.45-0.60% of C and about 2% each Ni and Cr is formed into a shell. The shell is slowly heated from the cold to 750-800° during several hrs., maintained at this max. temp. for several hrs. and then allowed slowly to cool during several hrs. It is then finished to the required size and shape without hardening or tempering treatment.

Annealing metal castings. D. MACINTOSH. U. S. 1,356,644, Oct. 26. Castings of malleable Fe to be annealed are embedded in granular CaCO₃, heated for some time to a high temp. and then allowed gradually to cool. Ground oyster shells may be used as the packing material.

Ferro-chromium. KRUPP AKT.-GES. Brit. 148,456, July 10, 1920. Ferro-chromium, low in C or in C and Si, is made by transferring molten high-C ferro-chromium from a blast furnace into a converter, which may be acid-lined, and blowing therein with or without the addition of CaO or other basic materials, or the injection of steam or other gas or vapor into the blast.

Alloys. ISABELLENHÜTTE GES. Brit. 148,505, July 10, 1920. Alloys containing Mg, Si and Cu are obtained by fusing Si with Fe, Mg and Cu, or with an alloy of these metals, or with Mn-Cu alloys, or by fusing ferrosilicon with an Fe-Mg-Cu alloy or with Cu and ferromanganese. The alloys may contain 0.5 to 13% of Si. One or more other metals, *e. g.*, Sn, Zn or Al, may be added, and in such cases the Si may be added in the form of an alloy with the additional metal.

Alloys. H. LEISER. Brit. 148,533, July 10, 1920. A method of making alloys consists in forming from one of the constituent metals of higher m. p. a porous mass by the application of pressure to powder or small pieces of the metal, heating such mass, and then immersing it in a molten bath of the other metal or metals. *E. g.*, by immersing a mass of Fe, prep'd. as described, in molten Cu, a product may be obtained containing 30-60% of Cu and 40-70% of Fe. Brass-iron, zinc-iron, bismuth-iron, Ag-Ni, and alloys containing Ni and Cr are also referred to. In some cases the molten bath may contain a small proportion of the metal of the compressed mass, or the latter may contain some of the metal or metals of the molten bath; *e. g.*, it may be formed from Fe particles coated with Cu by treatment with a Cu soln. The alloys may be annealed in a current of H at a temp. higher than the m. p. of Cu.

Iron-cobalt-chromium alloy. F. A. FAHRENWALD. U. S. 1,357,549, Nov. 2. An alloy resistant to high temps. and suitable for furnace parts is formed of Fe 70, Co 13.5, Cr 15, C 0.5, Si 0.5 and Mn 0.5 parts.

Chromium alloy for chemical ware. F. A. FAHRENWALD. U. S. 1,357,550, Nov. 2. An alloy suitable for the manuf. of chem. ware which is exposed to corrosive substances is formed of Cr 40-60, Fe 10-40, Mo 10-20, C and Si each less than 1 part.

Platinum alloy. F. E. CARTER. U. S. 1,357,272, Nov. 2. An alloy suitable for magneto contacts and other uses as a substitute for Pt-Ir is formed of Pt combined with Au 5-15%, Ag 0.5-5% and Pd 0.5-5%.

Crucible for treating metals. H. KOPPERS. U. S. 1,357,782, Nov. 2. A crucible suitable for desulfurizing metals such as Fe or Fe alloys is formed of a vessel of refractory material with a foraminous horizontal partition through which molten metal may flow from the upper to the lower portion of the vessel in the form of a spray. A tap-

ping pipe is so placed in the wall of the lower portion as to maintain a const. level of slag and molten metal in the lower portion of the vessel.

Alloy-coated wire. J. L. SCHUELER. U. S. 1,357,907, Nov. 2. Fe or steel wire to be alloy-coated is introduced into a molten bath formed of Pb 91%, Sb 8% and Zn 1%, and removed from the bath in a vertical direction so that excess coating metal drains back into the bath and wiping of the wire is rendered unnecessary.

Welding metals. DEUTSCH-LUXEMBURGISCHE BERGWERKE, HÜTTEN-AKT.-GES., and S. HILPERT. Ger. 318,455, Jan. 13, 1917. In a process of welding metals with the employment of a fluxing agent and a welding powder containing a reducing agent, aromatic hydrocarbons, boiling above 120°, are used as reducing agents. Powdered naphthalene is mentioned as particularly suitable.

Arc fusing or welding of metals. THEODORE KAUTNY. Ger. 318,499, Nov. 19, 1915. The workpiece and the welding rod, or one of these, is covered with a heavy oil. Substances dissolving oxide may also be added to the oil.

Autogenous welding of aluminium. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger. 319,684, May 2, 1917. Sol. F compds., or other salts which give no insol. residues in H₂O, are employed as a welding agent instead of insol. or difficultly sol. salts, as additions to the alkali halogens.

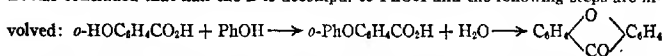
Solder. B. E. NEWELL. U. S. 1,357,297, Nov. 2. A soldering compn. suitable for use on tempered saw blades is formed of NH₄Cl 0.5 oz., borax 1 oz., Hg 2.5 oz., Sn 10 oz., and Pb 13 oz.

Soldering flux. L. A. INMAN and A. S. HARRIS. U. S. 1,357,871, Nov. 2. A flux for use in soldering is formed of glycerol 2, NH₄Cl 1 and ZnSO₄ 1 part.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER.

A comparative study in the xanthone series. I. SURENDRA NATH DHAR. Imp. Coll. Sci. Techn. J. Chem. Soc. 117, 1053-70(1920)—A comparison of xanthone (A) and anthraquinone and their derivs. is discussed in detail. A may be halogenated and nitrated and enters into a Skraup synthesis more easily than anthraquinone. A is also more stable. The theory of the formation of A from salicylic acid (B) is discussed. D. has concluded that half the B is decompd. to PhOH and the following steps are involved:



+ 2H₂O. These conclusions are drawn from the fact that on addition of 1 mol. of PhOH to B, the yield of A is double that from B alone. With PhNO₂ in place of PhOH, no increase is observed but with *o*-NO₂C₆H₄OH in place of PhOH, the 4-NO₂ deriv. of A is produced. Ac₂O aids the reaction as a dehydrator. 100 g. of B and 100 g. of Ac₂O give 20 g. of A but 50 g. B, 50 g. PhOH and 100 g. Ac₂O heated for 6 hrs. and distd. give 20 g. of A. *o*-AcOC₆H₄CO₂H boiled alone or with Ac₂O gives A corresponding to 20% of B. 1-Nitroxanthone (C) is obtained from 1.6 g. *m*-NO₂C₆H₄OH in 20 cc. MeOH containing 0.4 g. Na when treated with 1.5 g. *o*-ClC₆H₄CO₂H and a trace of Cu powder; the MeOH is evapd. and the mixt. heated to 110°, the cooled mass powdered, heated with 15 cc. concd. H₂SO₄ and the acid ext. poured into H₂O. It forms brown needles, m. 210°. In a similar way, 4.2 g. *o*-NO₂C₆H₄OH, 20 cc. MeOH, 0.7 g. Na, 4.7 g. *o*-ClC₆H₄OH and a trace of Cu powder are heated first to 140° for 20 min. till the orange-brown liquid changes to a gray-red jelly, then carefully to 160° when solidification takes place; by extn. with H₂SO₄ and pptn. with H₂O, 2-nitroxanthone (D) is obtained, brown needles from EtOH, m. 200°. 3-Nitroxanthone (E) (see Ullman) is obtained by dissolving with stirring 6 g. A in 12 cc. concd. H₂SO₄ and 1.4 cc.

HNO₃ (d. 1.5), allowing to stand overnight, pouring into H₂O, treating the ppt. which forms with EtOH, filtering from insol. matter consisting of β -dinitroxanthone and evapp. *q*-Nitroxanthone (F) is formed from 50 g. B, 50 g. *o*-NO₂C₆H₄OH and 100 g. Ac₂O by boiling 10 hrs., then distg.; the small amt. of high boiling tarry material is boiled with EtOH and boneblack and yields 2.5 g. of yellow needles, m. 127°. β -(2,7)-Dinitroxanthone (G) from 2 g. of A in 5 cc. HNO₃ (d. 1.5), heated 10 min. at 100°, ppt. sepg. in white needles from HNO₃, m. 254°. The filtrate from G on addition of H₂O gives α -dinitroxanthone (H), purified from HNO₃. G is also obtained from D and a mixt. of concd. HNO₃ (d. 1.42) and concd. H₂SO₄; after standing overnight, H₂O is added to ppt. the compd. 2,4-Dinitroxanthone (Mayer) may be made as follows: A mixt. of 1.2 g. 2,4-(NO₂)₂C₆H₃OH, 0.17 g. Na in 20 cc. MeOH and 1.2 g. *o*-ClC₆H₄OH with a trace of Cu powder is evapd. and the residue heated to 160°; when the mass solidifies, it is cooled, powdered, heated to 160° and the process repeated 10 times, then extd. with 15 cc. concd. H₂SO₄ for 15 min. and the acid poured into H₂O; it forms yellow needles from EtOH, m. 206°. The filtrate from the crystn. of G made by the nitration of D gives a ppt. with H₂O, 2,3,7-Trinitroxanthone (I), m. 205°. I may also be obtained by heating at 100° for 24 hrs. a mixt. of E or G with concd. HNO₃ (d. 1.5) and concd. H₂SO₄. Dinitroaminoxanthone (J), from (NH₄)₂S in EtOH and I, forms a brown powder from EtOH, m. 230° (decompn.). J diazotized and coupled with β -C₁₀H₇OH gives dinitroxanthoneazo- β -naphthol (K), dark red powder from EtOH, m. 270°. Another trinitroxanthone (L) not identical with I is formed by dissolving A in concd. H₂SO₄ with the aid of heat, cooling and adding HNO₃ (d. 1.5), then heating the mixt. at 100°; yellow crystals sep., m. 225°. L and (NH₄)₂S in EtOH give dinitromonoaminoxanthone, yellow powder m. 290°. C in concd. H₂SO₄ with HNO₃ (d. 1.42) after 12 hrs. deposited *i*-tetranitroxanthone, yellow-white needles, m. 250°. E in concd. H₂SO₄ with HNO₃ (d. 1.42) after standing a few days gives red-yellow ppt., *q*-tetranitroxanthone (M), does not m. 300°. The filtrate from M, on addition of H₂O gives a brown powder, *q*-tetranitroxanthone, m. 200° (decompn.). H with concd. H₂SO₄ and HNO₃ (d. 1.42) at 100° gives a deposit in 6 hrs. of α -tetranitroxanthone (N), yellow-white crystals not melting at 300°. N heated with Br and a trace of I in a sealed tube gives dibromodinitroxanthone, m. 265° (C. A. 14, 3403). The filtrate from N gives on addition of H₂O, α -tetranitroxanthone (O), does not m. 300°. O heated with Br in a sealed tube gives a tetrabromoxanthone, m. 255°. On heating G with concd. H₂SO₄ and HNO₃ (d. 1.42) for 6 hrs., yellow-white crystals of N ppt.; from the filtrate is obtained β -tetranitroxanthone (P), white crystals, does not m. 300°. P heated with Br in a sealed tube gives a hexabromoxanthone, m. 285°. 3 g. of G in 5 cc. of concd. H₂SO₄ and 12 cc. C₆H₅(OH)₂ are heated to 140°; shaken and the temp. lowered to 120° and kept there 4 hrs., then 5 hrs. at 140°; the mass is powdered, boiled with H₂O, filtered and made alk., when a red ppt. of nitroxanthoquinoline forms which crysts. from EtOH, sinters 200° and m. 205-10°. H on refluxing with MeOH and Na for 2 hrs., filtering and acidifying gives α -dinitroxanthrol, brown needles from HOAc, m. 185°. On reduction in the same way G gives β -(2,7)-dinitroxanthrol, yellow-white needles, m. 196° (decompn.). A mixt. of 1.6 g. *o*-ClC₆H₄CO₂H, 1.4 g. *m*-ClC₆H₄OH, 0.4 g. Na and a trace of Cu powder in 10 cc. MeOH is heated till all the MeOH is evapd., then to a temp. of 200°; a solid forms, is cooled, powdered and heated with 15 cc. concd. H₂SO₄ and the acid added to H₂O, thus giving *i*-chloroxanthone (Q), white needles from aq. EtOH, m. 100°. Q boiled with PhNH₂ and a trace of Cu powder for 6 hrs. gives on pouring into H₂O and HCl a blue ppt., *i*-anilinoxanthone, m. 120-125°. Q with concd. H₂SO₄ and HNO₃ (d. 1.42) gives a ppt. of *i*-chlorotetranitroxanthone, m. 195°. Just as Q is produced, 2-chloroxanthone (R) may be formed from 1.4 g. *p*-ClC₆H₄OH, 1.6 g. *o*-ClC₆H₄CO₂H, 0.4 g. Na, 10 cc. MeOH, and a trace of Cu powder, white needles from EtOH, m. 165°. R with

concd. H_2SO_4 and HNO_3 (d. 1.42), gives *2-chlorotetranitroxanthone*, yellow-white needles, m. 205° . *4-Chloroxanthone* (S) is produced in similar way to Q from *o*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$ and *o*- $\text{ClC}_6\text{H}_4\text{OH}$, white needles from EtOH, m. 130° . S nitrates to the less sol. *4-chlorodinitroxanthone*, brown-yellow needles, m. 235° , and the more sol. *4-chlorodinitroxanthone*, yellow powder, m. $195\text{--}200^\circ$. *Dichloroxanthone* (T) is formed by heating at 100° 7.5 g. A, 50 cc. HOAc and a trace of I and passing in dry Cl till 1 mol. is absorbed; white needles from EtOH, m. 225° . T gives on nitration *dichlorodinitroxanthone*, yellow needles, m. 240° . Just like the Cl compds., the Br compds. are formed; *2-bromoxanthone* (U) from *p*- $\text{BrC}_6\text{H}_4\text{OH}$, *o*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$, Na, MeOH and a trace of Cu powder, forms brown needles from aq. EtOH, m. 150° . U nitrated, gives on pouring into water, a mixt. of two NO_2 compds., *2-bromo- α -tetranitroxanthone*, brown needles from EtOH, m. 210° , and *2-bromo- β -tetranitroxanthone*, insol. in EtOH but forming brown needles from C_6H_6 , m. 270° . U heated with Br and a trace of I in HOAc gives *2,7-dibromoxanthone*, m. 212° . *4-Bromoxanthone* (V), from *o*- $\text{BrC}_6\text{H}_4\text{OH}$ and *o*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$, forms white needles from EtOH, m. 140° . V nitrated gives *4-bromodinitroxanthone*, yellow needles, m. 295° .

ROGER ADAMS

Synthesis of boranilides. I. Boranilide and its derivatives. TARINI CHARAN CHAUDHURI. Krishnath College, Berhampore, India. *J. Chem. Soc.* 117, 1081-86 (1920).—The anilide and many substituted anilides of H_3BO_3 were prepd. in order to study their physiol. action. *Boranilide* (A), PhNHBO , is made by heating with stirring to $135\text{--}40^\circ$, 5 g. H_3BO_3 , 7.5 g. PhNH_2 and 1 g. fused ZnCl_2 ; the fused mass is extd. with H_2O , very dil. HCl, then warm H_2O and then crystd. from EtOH. It is sol. in acids and alkalis. *Hydrochloride*, green plates, m. $108\text{--}10^\circ$. *chloroplatinate*, yellow crystals, $(\text{PhNHBO})_2\text{H}_2\text{PtCl}_6$. *Benzoyl-boranilide* (B), from BzCl in HOAc, forms a white powder, m. 166° . *Thioboranilide* (C), by heating A with excess of S for 10 min., forms a yellow-grey powder m. $109\text{--}10^\circ$. *Nitrosoboranilide* (D), from A in excess of HCl and NaNO_2 , forms an oil, which solidifies on addition of EtOH, m. 83° . *p*-*Bromoboranilide* (E), from Br and A in HOAc is purified by shaking with CHCl_3 and treating the insol. portion, consisting of E acetate, with aq. K_2CO_3 , m. $121\text{--}122^\circ$; the sol. portion in CHCl_3 with aq. K_2CO_3 gives *o*-*bromoboranilide* (F), yellow crystals, m. 82° . Br in H_2SO_4 and A give black crystals which on dissolving in H_2O and boiling with aq. K_2CO_3 give *m*-*bromoboranilide* (G), violet powder, m. $96\text{--}97^\circ$; if the black crystals are boiled with H_2O , they are converted into a mixt. of the acetates of E and F. *Benzoyl-p-bromoboranilide* (H), from BzCl and E in HOAc, forms white crystals, m. $128\text{--}30^\circ$. *Boryldiazoaminobenzene* (I), $\text{PhN}=\text{NN}(\text{BO})\text{Ph}$, from PhNH_2 and D in HCl in EtOH and Et_2O , seps. on addition of H_2O as red crystals, m. 109° . *Borylhydrazoaminobenzene* (K), $\text{PhNHNHN}(\text{BO})\text{Ph}$, from I in EtOH with SnCl_4 and HCl, then addition of excess alkali and extrn. with Et_2O , m. $123\text{--}4^\circ$. *Boro- α -phenyl- β -aminophenylhydrazide* (L), $\text{H}_3\text{NC}_6\text{H}_4\text{NHN}(\text{BO})\text{Ph}$, from K boiled with concd. HCl and made alk. with NH_4OH , forms a yellow-grey compd., m. $163\text{--}6^\circ$. *Boro- α -phenylhydrazidobenzeneazophenol* (M), $\text{HOC}_6\text{H}_4\text{N}_2\text{C}_6\text{H}_4\text{NHN}(\text{BO})\text{Ph}$, from diazotization of L and coupling with PhOH in alk. soln., m. $152\text{--}3^\circ$; *dibenzoylboro- α -phenylhydrazidobenzeneazophenol*, from BzCl and L in the presence of alkali, forms brown crystals from Et_2O , m. $113\text{--}5^\circ$.

ROGER ADAMS

The constitution of catechin. II. MAXIMILIAN NIERENSTEIN. Univ. Bristol. *J. Chem. Soc.* 117, 1151-61 (1920); cf. C. A. 14, 3402.—*3,4,2',4',6'-Pentamethoxydiphenylacetyl chloride* (A) was prepd. by heating 6.5 g. of the acid and 10 g. SOCl_2 for 3 hrs.; the excess SOCl_2 is removed by distn. *in vacuo* and the residue dissolved in dry PhH; to remove traces of SOCl_2 the residue after evapn. of the PhH is kept over solid KOH; from PhH it forms needles, m. 76.5° . 6 g. A in dry Et_2O was treated with N_2CH_3 prepd. from 30 cc. $\text{MeN}(\text{NO})\text{CO}_2\text{Et}$ (B) until N evolution ceases and then a second equal portion of B was added; after standing several days protected from H_2O , the

Et₂O was removed and the residue of 3,4,2',4',6'-pentamethoxydiphenylmethyl chloromethyl ketone (C) was recrystd. from PhH, m. 102°. 3,4,2',4',6'-Pentamethoxy- α,α -diphenylpropane (D) was prepd. by heating 6 g. C in 200 cc. EtOH on a water bath with 20 g. Na until the latter disappears; after concg. to 50 cc. and pptg. with water, it was recrystd. from EtOH, m. 83-4°. It is identical with the methylated reduction product obtained by Kostanecki and Lampe—2'-hydroxy-3,4,4',6'-tetramethoxy- α,α -diphenylpropane (E) (cf. C. A. 1, 1276). On distg. K. and L.'s reduction product, b₁₁ 235-8°, a sample is obtained which readily solidifies and may be used for seeding other material without a previous distn.; adhering oily impurities are removed by washing with petr. ether; crystals from EtOH, m. 106°. On treatment with Me₂SO₄, D is obtained. When E is oxidized in a hot alk. soln. with KMnO₄, filtered, acidified with H₂SO₄, extd. with Et₂O and the ext. evapd. a residue of 2'-hydroxy-3,4,4',6'-tetramethoxydiphenylacetic acid (F) is obtained which forms long needles from H₂O, m. 168-9°; on drying at 110° one mol. H₂O is lost; the anhydrous acid m. 172-3° and is insol. in PhH or PhMe. When treated with Me₂SO₄, 3,4,2',4',6'-pentamethoxydiphenylacetic acid, m. 150-1°, is formed; N₂CH₂ converts F into the corresponding Me ester, m. 119°; an acetyl derivative of F crystals from EtOH in needles, m. 183-4°. 3,5,3',4'-Tetramethoxy-2-phenylcoumaran-1-one was prepd. by digesting 1 g. of F with 30 cc. Ac₂O and 3 g. AcONa, pptg. with H₂O and recrystg. from EtOH; needles, m. 117°. Some of the compds. described in this and the preceding paper were simultaneously prepd. by Freudenberg (cf. C. A. 15, 78-79(1921)), but N. disagrees with some of the conclusions drawn by F.

N. A. LANGE

The action of amines on trinitrophenylmethylnitroamine. THOMAS C. JAMES, JAMES I. M. JONES and ROBERT I. LEWIS. Edward Davies Chem. Labs. *J. Chem. Soc.* 117, 1273-80(1920).—This investigation was undertaken with a view to ascertain whether trinitrophenylmethylnitroamine (tetryl) (A) forms additive compds. similar in type to those with sym-C₆H₃(NO₂)₃ (cf. C. A. 4, 2116). Solns. of A in various solvents become deeply colored on the addition of amines except where the latter contain strongly negative radicals, showing that additive compds. are formed; these are compds. of A and the base in equimol. proportions. Additive compds. of A with phenols and tertiary amines were not isolated although evidence of formation is afforded by the production of color in solns. and the m. p. of mixts. of the components. The difference between these additive compds. and those of the C₆H₃(NO₂)₃ series is that in many cases they undergo a change to a condensed compd.: C₆H₃(NO₂)₃NMeNO₂.NH₂PH \longrightarrow C₆H₃(NO₂)₃.NHPh + NHMeNO₂ (B) (cf. *J. Chem. Soc.* 89, 583(1906)). B is probably decompd. as attempts to isolate it were not successful. Mol. wt. detns. of the additive compds. indicate that dissociation into the components is almost complete in dil. soln. The additive compds. were prepd. by adding the amine in EtOH, Me₂CO or PhH to an equimol. quantity of A in a similar solvent and allowing to remain until crystn. takes place. Picramide, m. 188°, was obtained on warming A and NH₃ in alc. Dry NH₃ passed into A in PhH containing some Me₂CO deposits a green oil which solidifies; the m. p. is about 100° (decompn.); an analysis gives C₁₀H₁₂O₃N₄. The red alc. soln. of MeNH₂ and A deposits red needles of 2,4,6-trinitrophenylamine; recrystd. from EtOH, yellow needles, m. 114.8°. PhCH₂NH₂ similarly yields the compound 2,4,6-(NO₂)₃C₆H₃.PhCH₂NH₂, needles from acid EtOH, m. 144.8°; the compound 2,4,6-(NO₂)₃C₆H₃.PhNH₂, from PhNH₂ in PhH, m. 64°, changes in a sealed tube during several weeks to 2,4,6-(NO₂)₃C₆H₃.NHPh (C); C is also obtained by slow crystn. of A and PhNH₂ in warm PhH, m. 178° (cf. *Ber.* 33, 188(1900)). The compound 2,4,6-(NO₂)₃-C₆H₃.o-NH₂C₆H₄Me, prepd. in hot PhH, m. 63°; prolonged boiling does not condense it to 2,4,6-(NO₂)₃C₆H₃.NHC₆H₄Me. The addition compound with *m*-toluidine was not obtained pure as it readily changes to a scarlet labile condensation product of 2,4,6-(NO₂)₃C₆H₃.NHC₆H₄Me; recrystd. from acidified EtOH, the yellow stable modification

is obtained, m. 129° (cf. C. A. 4, 899). With *p*-toluidine the additive compound was obtained from PhH or EtOH, m. 54°; it condenses to form the compound 2,4,6-(NO₂)₃-C₆H₂NHC₆H₄Me, m. 163.5° and 165°. *m*-Xylidine forms a very unstable additive compd. with A which readily condenses to 2,4,6-trinitro-*m*-xylylamine, m. 157°. No additive compds. were isolated with *o*- or *p*-anisidine, the former condensing to 2',4',6'-trinitro-2-methoxydiphenylamine, m. 143°, and the latter to 2',4',6'-trinitro-4-methoxydiphenylamine, m. 172.5°. The additive compd. with *p*-HOC₆H₄NH₂ was not obtained pure as it readily condenses to 2',4',6'-trinitro-4-hydroxydiphenylamine, m. 174°. α -C₁₀H₇NH₂ readily forms an additive compd. from PhH, m. 94°; no condensation was obtained after long boiling. β -C₁₀H₇NH₂ yields an additive compd., m. 90°, which does not condense. *m*-C₆H₄(NH₂)₂ forms an additive compd. in PhH, m. 84°; on recrystn. from hot Me₂CO it condenses to 2,4,6-trinitro-*m*-aminodiphenylamine, m. 207°. PhNHMe forms an additive compd., m. 86°; no condensation deriv. was obtained. PhNMe₂, PhNH₂Et and PhNEt₂ all yield colored solns. but additive compds. were not isolated; condensation to picryl derivs. does not occur on long boiling in EtOH or Me₂CO. *m*- and *p*-Nitroaniline yield colored solns. but the isolation of additive compds. was not successful; f. p. curves of mixts. with A indicate that unstable mol. compds. can exist. Halogen-substituted amines form no additive or condensation compds.

N. A. LANGE

Catalysis in the hydrolysis of esters by infra-red radiation. ERIC K. RIDGAL AND JAMES A. HAWKINS. Univ. of Ill., and Trinity Hall, Cambridge. *J. Chem. Soc.* 117, 1283-96(1920).—The sun was used as a source of radiation, the spectrum being obtained by dispersion through a system of lenses and a quartz prism; the portion of spectrum employed was from the red just beyond the visible and extending to an indefinite extent into the infra-red. The AcOMe was illuminated directly with the radiation without the intervention of glass. A control sample kept at the same temp. as the other sample was titrated simultaneously with 0.054 *N* Ba(OH)₂. The expts. indicate that the hydrolysis of AcOMe is catalytically accelerated by infra-red radiation; the spectral region of photoactivity is in agreement with that calcd. on the activation and quantum theory of chemical action. Two different theories may explain this catalysis; (a) an increase in the activating radiation density or (b) an alteration in the mechanism of the reaction. R. and H. believe (b) to be the more likely and they expect to extend this investigation in greater detail.

N. A. LANGE

Contribution to the study of chlorinated methyl carbonates; systematic chlorination of methyl carbonate. ANDRÉ KLING, D. FLORENTIN AND E. JACOB. *Ann. chim.* 14, 189-214; cf. C. A. 14, 1304.

G. W. S.

The dehydration of alcohols by catalytic oxidation under reduced pressure. CHARLES MOURREU AND GEORGES MIGNONAC. *Compt. rend.* 171, 652(1920).—In the general method for the prepn. of aldehydes and ketones by the catalytic oxidation of the corresponding alcs. with air, the yields decreased as the mol. wt. of the alc. increased (cf. C. A. 14, 1657). In order to obtain better yields and to get a method of more general application the oxidation was carried on by conducting over the Ag catalyst a mixt. of an excess of the alc. vapor with O₂ under a pressure of 20 to 40 mm. and at a temp. of 230 to 300°. In this way PhCH₂OH and PhCH:CHCH₂OH gave 80 to 90% yields of the corresponding aldehydes; C₆H₄CH(OH)Me gave 70 to 80% yield of C₆H₄COMe; C₁₀H₂₁OH gave 80% yield of the corresponding aldehyde and geraniol gave citral without decompn.

G. W. STRATTON

The systematic breaking down of saturated dibasic acids of high molecular weight. MARCEL GODCHOT. *Compt. rend.* 171, 797-9(1920).—The di-Et or di-Me esters of dibasic acids on treatment with PhMgBr are changed to tertiary alcs., which are then converted to unsatd. hydrocarbons by dehydration and these hydrocarbons are finally

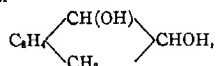
oxidized to form dibasic acids having always 2 C atoms less than the original acid. G. gives the results with suberic, azelaic and sebacic acids. Di-Et suberate with 4 mols. of PhMgBr gives *1,1,8,8-tetraphenyloctane-1,8-diol*, colorless tablets, m. $112-3^\circ$, quite sol. in boiling EtOH and giving a yellow fluorescence with cold concd. H_2SO_4 . Di-Et azelate likewise gives *1,1,9,9-tetraphenylnonane-1,9-diol*, needles, m. 136° , sol. in warm EtOH and giving an orange-red color in cold concd. H_2SO_4 . Di-Et sebate gives *1,1,10,10-tetraphenyldodecane-1,10-diol*, needles, m. $131-2^\circ$, sol. in warm MeOH and Et_2O , giving a yellow color in cold concd. H_2SO_4 changing to green on exposure to air. These alcs. are all dehydrated with boiling AcOH, giving, resp., *1,1,8,8-tetraphenyloctane-1,8-diene*, plates, m. $92-3^\circ$, quite sol. in boiling EtOH and requiring 4 atoms of Br; *1,1,9,9-tetraphenylnonane-1,9-diene*, an oily liquid, slowly coloring yellow, b_{10} 310° , d_{20} 1.047; *1,1,10,10-tetraphenyldodecane-1,10-diene*, colorless laminas, m. 107° , sol. in boiling EtOH. These three unsatd. hydrocarbons are all oxidized by KMnO_4 , giving in each case one mol of Ph_3CO and a dibasic acid with 2 C atoms less than the corresponding initial acid. These acids are resp., adipic, m. 149° ; pimelic, m. $105-6^\circ$, and suberic, m. 140° . These results indicate this reaction is a general one.

R. CHESTER ROBERTS

The purification of acetone. J. DUCLAUX AND A. LANZENBERG. *Bull. soc. chim.* 27, 779-82 (1920).—For the lab. purification of large vols. of Me_2CO , the bisulfite method is too cumbersome and the NaI method of Shipsey and Werner too expensive and difficult. D. and L. use the familiar reaction of Me_2CO and CS_2 , which gives a mixt. boiling at 39° . With the exception of methylal and MeOH, none of the other impurities of Me_2CO combine with CS_2 and are thus removed on fractionation. Methylal is never found in large quantities and is removed on fractionation at 31° as it forms a compd. with CS_2 boiling at that temp. The authors do not recommend their method when the sepu. of MeOH is necessary. Yields and purity of fractions are given in support of the method.

R. CHESTER ROBERTS

The hydriodides derived from two dihydronaphthalenes and indene. M. TIRFENEAU AND A. ORSKHOFF. Boucicaut Hospital, Paris. *Bull. soc. chim.* 27, 782-93 (1920).—1,2-Dihydronaphthalene (A) was made with 1,4-dihydronaphthalene and *iso*-AmONa instead of EtONa. A is treated with HgO and I forming the cryst. *hydriodide*, m. 126° . AgNO_3 added to this hydriodide in Et_2O forms *α -hydrindenepic aldehyde*, a colorless liquid, b_{10} 135° , d_4 1.095. Its *semicarbazone* crystals from alc. in small needles, m. $167-8^\circ$. Its *oxime* crystals from PhMe in large colorless crystals, m. $103-4^\circ$. The aldehyde is oxidized in alc. with AgNO_3 and $\text{Ba}(\text{OH})_2$, forming *α -hydrindenecarboxylic acid*, crystals from warm Et_2O in small needles, m. $59-60^\circ$. This acid is identical with the acid obtained by hydrogenation of *α -indenecarboxylic acid* with Na-Hg. The dibromide of A gives *1,2-dihydroxytetrahydronaphthalene* with K_2CO_3 , needles from Et_2O , very sol. in alc. and warm H_2O , m. $112-3^\circ$. The dibromide in Me_2CO with H_2O and crushed marble gives the *hydrobromide* of A, large colorless crystals, m. $112-3^\circ$, difficultly sol. in C_6H_6 and Et_2O , slightly sol. in warm H_2O and volatile in steam. This hydrobromide with K gives an oil, b_{20} $137-40^\circ$, d_4 1.1319, which is probably the corresponding ethylene oxide. This reaction was not studied because of poor yields. The *methyl hydriodide* of A was made from A with MeOH, HgO and I, a yellow oil, decomp. when distd. but purified by steam distn. KOH and this methyl hydriodide gave C_{10}H_8 , identified by its m. p. The hydriodide of 1,4-dihydronaphthalene with AgNO_3 is transformed into the glycol

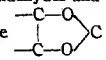


with very small quantities of the oxide or C_{10}H_8 . Indene in Et_2O with HgO and I gave the hydriodide of indene. This hydriodide with AgNO_3 gave 3 products: (1) An

unstable I-containing compd., m. 108–9°, which was not studied; (2) an oil, which gave a small quantity of regenerated indene when distd. in steam, and (3) a residue from the steam distn., which was recrystd. from alc. or C₄H₆ and found to be identical with hydrindenic glycol of Weissgerber, (*Ber.* 44, 1436(1911)). T. and O. discuss the theory of these reactions in detail.

R. CHESTER ROBERTS

Determination of the configuration of cyclic *cis*- and *trans*-diols and the rearrangements of atoms and groups of atoms during chemical reactions. J. BÖRSEKKE AND CHR. VAN LOON. *Proc. Acad. Sci. Amsterdam* 23, 69–73(1920).—Attention has already been called to the fact that indene oxide when being hydrated may yield the *cis*-diol as well as the *trans*-form. B. and L. have ascertained that the amts. formed of these compds. depend on the reaction of the medium, the formation of the *trans*-form being favored by an alk. medium. In detg. the configuration of the 2 diols unfortunately the classic method of testing the resolvability into optical antipodes is useless, since both diols are asym. and consequently resolvable. Recourse to another method was had. One of the diols was known to increase the cond. of H₂BO₃ and to this compd. is ascribed the *cis*-configuration. The cause of the increase in the acidic properties of H₂BO₃ is considered to be due to the formation of complex dissociable compds. formed when the 2 OH groups are situated "favorably" with respect to H₂BO₃. As the sole argument depends on the efficiency of the H₂BO₃ method, it called for a confirmation which could be given by an investigation on the cyclopentenediols. It allows verification of the method by the classic one as only the *trans*-diol is not identical with its mirror image and consequently resolvable into optical antipodes. One diol (A) m. 29–30°, was prepd. by hydrating cyclopentane oxide and the other (B) m. 54.5–55°, was prepd. from cyclopentene by oxidation with KMnO₄. The 2 glycols were treated with *l*-menthyl isocyanate. A yielded a single di-*l*-menthylurethan and B gave a mixt. of di-*l*-menthylurethans. The conclusion is drawn that urethans of the *trans*-diol were formed, viz., *d-trans*-cyclopentenediol di-*l*-menthylurethan and *l-trans*-cyclopentenediol *l*-menthylurethan. The conclusion that B is therefore the *trans*-form should not be made without considering that Walden's inversion might have taken place. Such an inversion is only to be expected when the reaction takes place at the atom which governs the configuration. In the reaction $\equiv\text{C}-\text{O}-\text{H} + \text{R}-\text{N}-\text{CO} = \equiv\text{C}-\text{O}-\text{CORNH}$ the OH group is detached and the typical C atom remains. It is concluded that A is the *cis*-form. A considerably augmented the cond. of H₂BO₃ while the *trans*-form caused a small depreciation. This method yields a positive value only when the 2 OH groups are near each other. Consequently the hydrindenediol m. 108° must be the *cis*-form, since it increases the cond. and the compd. m. 159° is the *trans*-isomer, since it decreases the cond. of H₂BO₃. van Loon investigated the cyclic addition compds. of polyals. with aldehydes and ketones (*Ber.* 28, 1146, 2496(1896)); 5- or 6-

membered rings of the type C (Me)₂ are formed, and it is highly improbable

that Walden's inversion takes place in this condensation. *cis*-Hydrindenediol and cyclopentenediol with pure Me₂CO contg. 1% HCl gave the compds. which were expected but the *trans*-compds. remained unchanged during 24 hrs. This method was used to show the configuration of the cyclohexanediols. The cyclohexanediol m. 104°, considered a *cis*-compd. by Brunel because it originated from the oxide, was obtained by the action of KOH on cyclohexene iodohydrin. The compd D m. 99° obtained from cyclohexene by the action of KMnO₄ was considered the *trans*-form. However, D yielded quant. an Me₂CO compd. and C did not react. Therefore, D must be considered the *cis*-form. However, both diols exercise a small negative influence on the cond. of H₂BO₃, so that here the Me₂CO method is the more reliable. The action of an active isocyanate on these compds. has not been tried. The configuration of the cyclopentene-

diols has been detd. in 3 ways, entirely independent of each other. A close study will have to be made of the rapid Me_2CO method, the disadvantage of which is that under the influence of HCl inversion is not impossible. The detn. of configuration of the cyclic 1,2-diols has brought to light the fact that by the addition of H_2O to the oxides, not only the *cis*-diol is formed, but also and at times exclusively the *trans*-isomer. If the oxide has the configuration in which the O atom lies outside the plane of the cyclopentane ring, then the opening of the 3-membered ring must have been accompanied by an inversion. This inversion in the case of sym. oxides of cyclopentene and cyclohexene is almost complete, but with the asym. indene oxide, the inversion is dependent on the action of the medium. A weak alk. reaction reduces the amt. of the *cis*-diol to zero, whereas in acid soln. this is the main product. When cyclopentene and cyclohexene are oxidized by KMnO_4 , the *cis*-diols are formed. Therefore the oxides cannot be the intermediate products as these would pass into *trans*-diols under the conditions of the expt. The production of *cis*-diols by KMnO_4 may be related to the formation of complex compds. of trivalent Mn.

H. E. WILLIAMS

Some condensation products of aromatic aldehydes and amines. F. M. JÄGER. *Proc. Acad. Sci. Amsterdam* 23, 74-83(1920).—According to Hantzsch and Werner's theory, stereoisomeric forms should be possible in the case of the condensation products of aromatic aldehydes and amines of the type $\text{R}'\text{—CH=N—R}$, yet for a long time definite cases of such isomerism seemed wanting (*Ber.* 34, 822(1901)). Anselmino (*Ber.* 38, 3989(1906); 40, 3465(1907)) described 2 different cryst. modifications of a compd. of this type, one red and the other yellow, and concluded that this was not a case of dimorphism but of chem. isomerism. J. considers that the arguments brought forth by A. for demonstrating that neither enantiotropic nor monotropic relations obtain between the red and yellow modifications of *o*-hydroxy-*m*-methyl benzylideneaniline (A) are not convincing. The question about the discrimination between cases of "physical" and "chemical" isomerism seems, in the light of recent investigations of crystals by means of X-rays, to have no longer any real significance at least for solid matter. The red and yellow modifications of A seem to be related as true enantiotropic forms as in the case of monoclinic and rhombic S. A occurs in a red (m. 74°) and a yellow form, m. 70° (Traube and Schmeling, *Diss. Greifswald*, 1905, pp. 56, 58). A yields with Me_2SO_4 at 40° pale yellow crystals from ligroin, *o*-methoxy-*m*-methylbenzylideneaniline (B). A with MeMgI in boiling Et_2O with subsequent H_2O treatment gave *o*-hydroxy-*m*-methyl- α -anilinoethylbenzene, m. 90° . B with MeMgI and then with H_2O treatment gave *o*-methoxy-*m*-methyl- α -anilinoethylbenzene, m. 78° . This product is a colorless, refracting material and was crystd. from ligroin. *o*-Hydroxybenzylideneaniline (C) was obtained from salicylaldehyde and PhNH_2 . The α -form of the dimorphous material is rhombic and the β -form is monoclinic; both compds. are yellow. C with MeMgI gave α -anilinoethylanisole, m. 46° . Anisaldehyde and PhNH_2 gave *p*-methoxybenzaldehyde, m. 63° , colorless transparent crystals from ligroin. Crystallographic data covering all of the compds. reported in this paper are given. Further work is in progress.

H. E. WILLIAMS

Influence of different substances on the decomposition of monoses by an alkali and on the inversion of cane sugar by hydrochloric acid. H. I. WATERMAN AND J. GROOT. *Proc. Acad. Sci. Amsterdam* 23, 149-61(1920).—The authors give tables showing how the inversion of saccharose by HCl is influenced by α -hydroxynaphthoic, cinnamic, *o*-coumaric and *o*-phthalic acids, the action being followed polarimetrically. The influence of *o*-phthalic, α - and β -naphthoic, cinnamic, *o*-coumaric, and β -hydroxynaphthoic (2:3) acids on the decompn. of glucose by an alkali was also studied, as well as the action of Schäfer salt and $p\text{—HOOC}_6\text{H}_4\text{SO}_3\text{Na}$ and G-salt. The influence of α - and β -naphthol and β -hydroxynaphthoic acid on the inversion of sucrose by HCl was also investigated.

H. E. WILLIAMS

Recent advances in science. **Organic chemistry.** P. HAAS. Univ. London. *Sci. Progress* 15, 192-4(1920); cf. *C. A.* 14, 2776.—Review. JOSEPH S. HEPBURN Oskar Piloty. C. HARRIES. *Ber.* 53A, 153-68(1920).—An obituary. A list of references is given to Piloty's published works. E. J. C.

The mucilaginous substance of Florideae (Takahashi) 11D. Existence of hydrated or anhydrous compounds of sucrose with certain salts (Helderman) 28. The reduction kinetics of the azo compounds (Goldschmidt, Braanaas) 2. The relation between the volume and the velocity of some organic ions (Smith) 2. Fatty acids from mineral oils (Brit. pat. 148,358) 22.

SERGEANT, F. PILKINGTON: **Elementary Organic Chemistry.** 2nd Ed. London: H. K. Lewis & Co. 100 pp. 4s. For review see *J. State Med.* 28, 320(1920).

McCOLLUM, ELMER V.: **A Text-book of Organic Chemistry for Students of Medicine and Biology.** 2nd Ed., revised. New York: The Macmillan Co. 466 pp, \$3.60.

STEEL, MATTHEW: **A Laboratory Manual of Organic Chemistry for Medical Students.** 2nd Ed., revised and enlarged. New York: John Wiley & Sons. 284 pp. \$1.75 net.

Phenolphthalein compounds with alkali metal carbonates. A. v. SZTANKAY. U. S. 1,357,482, Nov. 2. Double compds. of phenolphthalein with NaOH or Na₂CO₃ are prepd. by mixing aq. solns. of the components in cold soln. The products are insol. in ether, petroleum ether, xylene, toluene, CCl₄, CHCl₃ and amyl alc.

Furfural. K. P. MONROE. U. S. 1,357,467, Nov. 2. Extd. corn-cob pentosan is boiled with H₂SO₄, furfural and volatile org. acids are sep'd. from the reaction mixt. by distn. and fractionation and the acids are neutralized with Ca(OH)₂ or other alkali. in order to recover their salts.

Tetrahydronaphthalene derivatives. TETRALIN GRS. Brit. 148,408, July 10, 1920. Sulfonation of tetrahydronaphthalene with H₂SO₄ produces tetrahydronaphthalene-β-sulfonic acid; fusion of this acid or its alkali salts with caustic alkalies or milk of lime gives tetrahydro-β-naphthol. Heating a soln. of the tetrahydro-β-naphthol in H₂SO₄ gives its α-sulfonic acid, which on nitration gives a dinitrotetrahydronaphthol. Treatment of tetrahydronaphthalene with chlorosulfonic acid gives tetrahydronaphthalene-β-sulfonyl chloride; this compd. gives an amide on treatment with NH₃, or on hydrolysis by alkalies gives alkali salts of the β-sulfonic acid. The sulfonyl chloride may also be obtained by chlorinating the sulfonic acid. The sulfonyl chloride on reduction, *e. g.*, by means of Zn and acid or by electrolysis, gives tetrahydro-β-thionaphthol; this body gives a methyl ether on treatment with dimethyl sulfate and a thio-glycolic acid by reaction with chloroacetic acid; air oxidation of its ammoniacal alc. soln. gives the corresponding disulfide.

Tetrahydronaphthalene derivatives. TETRALIN GRS. Brit. 148,419, July 10, 1920. The treatment of α-tetrahydronaphthalene with chlorosulfonic acid at low temps. produces a mixt. of the 1- and 2-sulfonyl chlorides in about equal parts. The two isomers may be sep'd. by the following methods: (1) The sulfonyl chlorides are hydrolyzed by H₂O to the sulfonic acids, which are sep'd. by means of their different solubilities in CHCl₃; (2) the sulfonyl chlorides are converted by NH₃ into sulfonamides, which are sep'd. by means of the different solubilities of their Na salts in H₂O; (3) the sulfonyl chlorides are reduced by Zn dust and HCl to the tetrahydrothionaphthols, which by reaction with chloroacetic acid yield the corresponding thioacetic acids, and these are sep'd. by means of the different solubilities of their NH₄ salts. Examples of these methods are given. The sulfonamides may be hydrolyzed to the sulfonic acids

or converted into tetrahydronaphthols by fusion with alkalis. The tetrahydrothionaphthols are converted into disulfides by air oxidation of the ammoniacal alc. solns. The tetrahydronaphthylthioacetic acids yield tetrahydronaphthylthioindigos.

Tetrahydronaphthalene derivatives. TETRALIN GES. Brit. 148,923, July 10, 1920. Nitro derivs. of tetrahydronaphthalene are obtained by treating tetrahydronaphthalene with a mixt. of HNO_3 and H_2SO_4 , or other nitrating mixts. such as HNO_3 and HOAc , containing not more than 25% of H_2O , the temp. being maintained below 50° during the earlier stages of the process. The homologs of tetrahydronaphthalene substituted either in the aromatic or cyclohexane ring by methyl, ethyl, etc. groups, and also the amino or hydroxy derivs. of tetrahydronaphthalene substituted in either ring may be nitrated similarly. Reduction of these nitro compds. by the usual methods, *e. g.*, by Sn or SnCl_2 and HCl , or by $\text{Na}_2\text{S}_2\text{O}_4$, or by H in the presence of a catalyst, gives the corresponding amino derivs. of tetrahydronaphthalene, etc.; as intermediate stages of the reduction there may be obtained hydroxylamine, hydrazo, azo, or azoxy compds.; the hydroxylamine derivs. may be rearranged to the *p*-aminohydroxy compds. and the hydrazo compds. to the corresponding benzidine derivs. Examples are given.

Butyl *p*-aminobenzoate. SOC. CHIMIQUE DES USINES DU RHONE ANCIENNEMENT GILLARD P. MONNET ET CARTIER. Brit. 148,743, May 12, 1920. Butyl *p*-aminobenzoate is obtained either by esterifying *p*-aminobenzoic acid with normal butyl alc., or by esterifying *p*-nitrobenzoic acid with normal butyl alc. and reducing the product.

Salts of sulfonic and alkylsulfuric acids. SUDFELDT & CO. Brit. 148,579, July 10, 1920. Salts of sulfonic and alkylsulfuric acids are prepd. by fractionally pptg. with an inorg. salt the acid resins obtained by treating mineral or tar oils with fuming H_2SO_4 . In an example the acid resin is agitated with a little H_2O at $90\text{--}100^\circ$, cooled, filtered; and about $1/10$ its wt. of a satd. soln. of NaCl is added. The ppt., consisting of neutral substances together with a small amt. of sulfonic acid salts, is filtered off and the remaining sulfonic acids are pptd. by addition of larger quantities of NaCl soln. The filtered salts are washed with salt soln. and may be purified by treatment with alc., or with oxidizing agents such as permanganates.

II—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, E. G. MILLER, JR., AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

Uric acid. L. DOZZI. *Gazz. ospedali clin.* 41, 17-8(1920).—Uric acid was purified from the org. substances which accompany the crude product, by means of repeated pptn. from soln. with H_2SO_4 followed by dil. alc., and agitation for several hrs. at room temp. If the pptn. occurs in the presence of natural pigments or artificial coloring matters the acid so obtained is a pure white powder and shows no affinity for the coloring matter. In opposition to this, Benoit (*Compt. rend. soc. biol.* 1919) states that the uric acid deposits in urine are always strongly colored, and that it is difficult to sep. the uric acid from the urinary pigments which it has adsorbed. It is known that many of the urinary pigments (*e. g.*, urochrome) have been shown not to be dialyzable and are considered by many authors to be colloids. The same thing has been shown to be true of many artificial coloring matters. Among substances found by D. to be adsorbed by uric acid on pptn. are: urochrome, biliverdin, litmus, saffron, hematin, xyldine red, vesuvine, methylene blue, Congo red and dimethyl-aminoazobenzene. Substances easily reduced or themselves pptd. by acidification do not lend themselves well to the expts. The conclusion reached is that uric acid

pptd. in the presence of a colloidal coloring matter will show this phenomenon of adsorption, but will ppt. pure when the coloring matter forms a true soln.

H. W. BANKS, 3RD.

The biochemistry of the phosphatides and sterols. I. R. BRINKMAN AND E. VAN DAM. *Biochem. Z.* 108, 35-51 (1920).—Studies of the blood of animals and man demonstrated that the increased osmotic resistance of the red blood corpuscles after washing with physiol. salt soln. is caused by the washing out of lecithin from the surface layer of the corpuscles. From this it is inferred that the lecithin of normal plasma is absorbed by the corpuscular surface and physiologically lowers the resistance: this phenomenon is antagonistically influenced by cholesterol. On the basis of these findings the authors developed a method for the detn. of the resistance, which allows the corpuscles to be studied in 2 ways, i. e., under the influence of their plasma and in the natural condition as obtained from bone marrow. A discussion is made of the analogy between the properties of the plasma lecithin and the normal complement and the applications of the observations to further study. II. The significance of cholesterol in the physicochemical properties of the cell surface. *Ibid* 52-60. Using the blood corpuscles of rabbits the authors studied the cause of the globular appearance of these cells when put into salt soln. and came to the conclusion that they have observed the presence of an elec. charge on the corpuscles. This electrical charge, which increases the weakly negative charge already present, arises from the static electricity carried by the cover glass. In salt soln. alone the corpuscles are of normal shape, but as soon as they are brought into contact with an electrified surface in the counting chamber of Thoma-Zeiss app. changes in shape occur which after a short time give rise after passing through the rosette—thorn-apple variations to the globular form. In serum, however, the corpuscles are apparently not susceptible to this electrical charge and the cause of the difference lies in the fact that in the plasma the corpuscles are surrounded by an isolating envelope or layer which disappears in the salt soln. Cholesterol is the substance which gives these properties to this absorbed layer, which is held in colloid soln. by the lecithin adsorbed upon the corpuscular surface. III. The significance of the functional antagonism between phosphatides and cholesterol. *Ibid* 61-73. When a predominantly lecithin-containing diet is fed for a week to rabbits an intensive intravital hemolysis and regeneration occur which have been accurately detd. by the method of resistance detn. described in I. The intravital hemolysis induced by the lecithinemia is of such a degree that hemoglobinuria occurs; but at the same time the formation of new corpuscles is greatly stimulated by the excess of lecithin, so that the regeneration is in equil. with the hemolysis. Hence for the maintenance of normal regeneration lecithin feeding is necessary. The authors are of the opinion that the presence of phosphatides and sterols in the animal organism always side by side in a certain proportion, finds its significance in the functional antagonism of these substances as shown by the fact that the relation lecithin:cholesterol is an actual cellular const., on which the corpuscular resistance, the elec. isolation of the cell, the ion-permeability of the cell surface and the H_2O content of the tissues are directly dependent. It is also shown that alterations of this quotient in pathol. conditions can be significant and particular attention is paid to the influence of the diet on the relation expressed. F. S. HAMMETT

Cuorin. HUGH MACLEAN AND W. J. GRIFFITHS. St. Thomas's Hospital, London. *Biochem. J.* 14, 615-17 (1920).—Cuorin, first isolated by Erlandsen (*C. A.* 1, 1576) is now shown to be no new lipid at all, but merely cephalin admixed with impurities; this confirms Levene and Komatsu's work (*C. A.* 13, 2676). M. and G. worked on the hypothesis that "cuorin" does not exist in fresh tissue as such, but is formed as the result of various manipulations utilized in the extrn. of lipins. By isolating the lipins from very fresh tissue (heart muscle) as rapidly as possible, using the purest of solvents,

the authors found that the substance which corresponded to Erlandsen's "cuorin" had a N:P ratio of nearly 1:1 instead of 1:2, and was really impure cephalin. This makes it probable that the tissues contain but 3 phosphatides, lecithin, cephalin and sphingomyelin. The phosphatides, together with the two cerebrosides, phrenosin and kersin, completes the list of lipin substances as we know them to-day.

BENJAMIN HARROW

Distribution of inorganic iron in plant and animal tissues. H. W. JONES. *Biochem. J.* 14, 654-64(1920).—The hematoxylin test for iron (Macallum, *J. Physiology* 22, 92(1897)) was used. This depends upon the blue-black coloration produced when hematoxylin in pure distd. water (0.3 g. in 50 cc. of water) is mixed with a dil. soln. of an iron salt. Plant tissues after being prepd. were stained for 12 hrs. in this soln., while sections of animal tissues were stained for 48 hrs. As a rule, the plant tissues gave the reaction more rapidly than animal tissues. The lower organisms of plant life gave a more intense reaction than those higher in the scale. Granules containing inorganic iron are present in almost all the nuclei of plants and animals. Aquatic animals contain more inorg. iron than those living on land; fetal tissues contain more than do adult tissues.

BENJAMIN HARROW

Viscosity values of protoplasm as determined by microdissection. WILLIAM SIEFRITZ. *Bot. Gaz.* 70, 361-86(1920).—The instrument used was a modification of the Barber pipet holder (*Philippine J. Sci.* 9B, 307(1914)), and the technic of the microdissection method is described by Chambers (*Biol. Bull.* 4, 121(1918)). S. finds that the viscosity of protoplasm varies from a degree slightly more than that of water to the firmness of a fairly rigid gel. Some of the factors that influence changes in rigidity of the cell are development, reproduction, mitosis, injury and death. At no one time is there a viscosity common to the protoplast as a whole; regions represented by the ectoplasm, the endoplasm, the nucleus and the chromatophores vary.

B. HARROW

Crystallization of hemoglobin. J. LACOSTE. *Annales inst. mod. clin. méd.* 4, 189 (1919); *Physiol. Abstracts* 5, 86(1920).—Washed erythrocytes are hemolyzed by means of CS₂ or ether; and the resulting soln. is filtered through paper. Use is made of a moist chamber; and the crystals are mounted in paraffin cells. JOSEPH S. HEPBURN

Oxidases and the defensive processes of the organism. D. HORACIO. *Annales inst. mod. clin. méd.* 4, 210(1919); *Physiol. Abstracts* 5, 102(1920).—In immunized horses, the endo-oxyphenolase is increased in both the plasma and the fibrin. A parallelism exists between phagocytosis and the oxidizing power. Apparently oxidases have an antagonistic action against the toxic products of fatigue.

JOSEPH S. HEPBURN

Combinations of hemoglobin with gases: oxygen, carbon monoxide, mixtures of the two gases. Nature of the combinations and discussion of the reactions of the equilibria which give them origin. M. NICLOUX. *Bull. soc. chim. biol.* 1, 114-45(1919); *Physiol. Abstracts* 5, 28(1920).—Hemoglobin (Hb), which has been rendered free from all salts by prolonged dialysis, reacts with O₂ according to the reversible equation $\text{Hb} + \text{O}_2 \rightleftharpoons \text{HbO}_2$. Blood, or Hb in the presence of salts, reacts with O₂ according to the reversible equation $\text{Hb}_n + n\text{O}_2 \rightleftharpoons \text{Hb}_n\text{O}_{2n}$, in which n represents the degree of aggregation of the Hb mols. The same equations hold true for the reactions between Hb and CO. An equation is also derived to express the reaction of Hb with a mixt. of O₂ and CO.

JOSEPH S. HEPBURN

Evidence on the nature of nuclear activity. DAVID H. TENNENT. Bryn Mawr Coll. *Proc. Nat. Acad. Sci.* 6, 217-21(1920).—The basophilic bodies, which occur in the cytoplasm during certain stages of cell division, are not in the nature of chromidia, but are the result of indirect nuclear activity. It is suggested that suspensoid particles, which are surrounded by emulsoid particles, coalesce as a result of dehydration

produced by an enzyme, which is emitted by the nucleus and passes into the cytoplasm. Since this change is reversible, and the basophilic particles again pass into soln. at a later stage of cell division, the process also has an elec. nature. .

JOSEPH S. HEPBURN

Relation between the isoelectric point of a globulin and its solubility and acid-combining capacity in salt solution. EDWIN J. COHN. *Proc. Nat. Acad. Sci.* 6, 258-63 (1920).—Tuberin (the potato protein) was suspended in water containing various concns. (always less than 0.1 *N*) of either HCl or NaOH; NaCl was then added to aliquots of each suspension so that its final concn. ranged from 0 to 5 g. per 120 cc.; after 6 hrs. at a const. temp., to attain equil., the p_H and the N content of the supernatant liquid were detd. The isoelectric point of tuberin was found to be an H-ion concn. slightly lower than 10^{-4} *N*; at this point, NaCl had least effect on the soly. of the protein. The soly. of tuberin was decreased by NaCl when that protein was ionized as a base and combined with acid at H-ion concns. greater than 10^{-4} *N*, and was increased by NaCl when the protein was ionized as an acid. "The classification of tuberin as a globulin depends . . . upon the soly. in salt solns. of the compds. that tuberin forms when ionized as an acid, and upon the insoly. of the products of the hydrolytic dissociation of these same compds."

JOSEPH S. HEPBURN

Analytical note on certain rhythmic relations in organic systems. ALFRED J. LOTKA. *Proc. Nat. Acad. Sci.* 6, 410-5 (1920).—A mathematical treatment of periodic phenomena in biological systems.

JOSEPH S. HEPBURN

Ludimar Hermann, 1838-1914. W. M. B. *Proc. Roy. Soc. London (B)* 91, pp. xxxviii-xl (1920).—Obituary notice including an account of Hermann's contributions to biol. chemistry.

JOSEPH S. HEPBURN

Proteolytic enzyme of fibrin. J. MÖLLERSTRÖM. *Upsala Lak. förhandl.* 25, 55-72 (1920); *Physiol. Abstracts* 5, 9 (1920).—Ox fibrin, which has been washed in running water for 1 week in the presence of CHCl₃, shows increased proteolytic activity, and readily becomes sol. in water or glycerol. The enzyme, or possibly mixt. of 2 or more enzymes, acts best in a neutral or a faintly alk. medium. JOSEPH S. HEPBURN

Reaction of nitrous acid upon arginine and formula for calculation of histidine. HIDESABURO SEKINE. *Nogakukaiho, Tokio* 1919, I, 197.—Arginine loses one-half of its N as amino N during treatment with HNO₂ at 20° for 2 or 3 hours. S. concludes that Van Slyke's formula for calcg. histidine must be changed as follows: Histidine N = $\frac{1}{2}(D - \frac{1}{2} \text{ arginine N})$.

Y. OKUDA

A method of preparation and some properties of a starch gel. CORNELIA LEE CAREY. *Bull. Torrey Botan. Club* 47, 455-63 (1920).—A stiff and fairly resistant starch gel is prepd. by pouring thin layers of a suspension of 100 g. of corn starch in 150 cc. H₂O into Petri dishes, and heating in an autoclave at 105-110° for 30 min. Strips of the gel dried at a low temp. swell considerably in H₂O, with very little loss by soln.

T. G. PHILLIPS

OPPENHEIMER, CARL: *Kleines Wörterbuch der Biochemie und Pharmakologie*. Berlin and Leipzig: Walter de Gruyter & Co. 228 pp. M. 16. For review see Z. *angew. Chem.* 33, II, 384 (1920).

Three lecture experiments (formation of metal complexes in biological liquids (PEREIRA) 2. Theory of alcoholic fermentation (NEUBERG) 16.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Theoretical and clinical consideration of the pancreatic secretion in the feces and duodenal juice, particularly of the proof of the presence of trypsin. K. ISAAC KRIEGER. *Arch. Verdauungskrankh.* 26, 351-64 (1920).—The rather carefully carried out expts. indicate that the use of the Berkefeld filter for classification and sterilization of fecal

exts. in testing for the presence of trypsin is of doubtful value, inasmuch as the greatest part of the enzyme is held back by the filter. On the other hand the use of a bacteria-rich filtrate obtained by filtration through paper is liable to yield a positive result which is no proof of the presence of trypsin in the feces and an undisturbed pancreatic secretion, since the intestinal bacteria simulate trypsin in the digestion of casein. A negative finding is of itself not conclusive evidence of a disturbance of the external secretion of the pancreas, for it is necessary to take into account an occasional absorption of the enzyme in the intestinal canal. It is not to be expected when one has for examn. feces that have undergone a strongly acid fermentation, that trypsin alone passes through unchanged. The sources of error in the detn. of diastase are small although acid fermentation is apt to act unfavorably. Accordingly, since the *trypsin* detn. in the feces has so many sources of error it appears as if the study of the diastase activity of the feces lends itself better to the problem of the presence or absence of a disturbance of external pancreatic secretion. When the diastase test is negative and in doubtful cases control tests on the duodenal juice should be made.

F. S. HAMMETT

The biological determination of cell- and bacteria-destroying substances in dilute solutions. I. Optochin. A. SCHNABEL. *Biochem. Z.* 108, 258-78(1920).—S. uses a method based on the reducing powers of the pneumococcus on methylene blue, which reduction is a function of the time and number of bacteria; is discontinued when the organisms are washed with a bouillon containing grape sugar; and is increased by serum, particularly that of guinea pigs, and grape sugar. When optochin is added to a culture of the organism in methylene blue it influences the reducing capacity of the pneumococci in very dil. solns. and its strength can thus be detd. The concn. limits depend on the number of bacteria, the time of action, and the temp. The reaction is most delicate at room temp. but is only quant. at 37°. F. S. HAMMETT

The futility of examining the filtrate for the presence of occult blood in the gastric contents. A. A. RUTZ. *N. Y. Med. J.* 112, 619-20(1920).—There is a distinct contrast between the filtered and the unfiltered gastric contents in their action toward occult blood tests: the former rarely is positive even when the latter is definitely so. Mere filtration, adsorption on food materials or inclusion in mucus is not responsible for the contrast. Expts. are briefly described which show that the HCl of the gastric juice in some way influences the material responding to the test for occult blood so that it no longer passes through the filter. When, however, both food particles and HC are present the hindrance to filtration is increased.

F. S. HAMMETT

Color standards for the colorimetric measurements of H-ion concentration p_H 1.2 to p_H 9.8. LEON S. MEDALIA. *Mass. Inst. Tech. J. Bact.* 5, 441-68(1920) A simple method using permanent easily prepd. solns. is described. No buffer solns. are used. The colors are obtained by using two tubes, one of which is made acid and the other alk. and which contain varying amts. of the indicator. The colors thus obtained were checked by the buffer soln. method of Clark and Lubs. The dyes used by Clark and Lubs were employed. The method is applicable to the titration of culture media, the measurement of changes of p_H in cultures, and the detn. of p_H in other liquids. With the exception of methyl red, the indicators were unaffected by the autoclave or by bacterial growth.

JOHN T. MYERS

C—BACTERIOLOGY

A. K. BALLS

The life-cycle changes of the so-called *C. hodgkini*, and their relation to the mutation changes in the species. RALPH R. MELLON. Rochester, N. Y. *J. Med. Res.* 42, 61-76(1920).—The difference in reaction to the Gram-stain of the coccoid bodies observed on artificial cultivation of a pure strain of *C. hodgkini* obtained by

the Barber technique is compared with tautomerism as illustrated by the behavior of diacetic acid.

E. B. FINE

Oligodynamics of silver. II. R. DOERR. *Biochem. Z.* 107, 207-18(1920); cf. C. A. 14, 3258.—The bactericidal action of metallic Ag is completely destroyed when the metal is heated, boiled several times with distd H_2O or repeatedly imbedded in agar. Ag so treated can be reactivated by contact with very dil. strongly dissociating acids. The presence of any traces of adhering acid plays no significant role. The chem. carrier of the oligodynamic Ag activity is dialyzable and in certain of the expts. there was found a difference of diffusibility of Ag_2O and the active principle. In agar the diffusibility of Ag_2O , $AgNO_3$ and the active principle shows no marked differences. The growth of the organisms studied under the influence of these compds. seemed to partake more of the nature of an increase in the size of the colonies rather than of an increase in their no. In blood-agar Ag produces a hemolytic zone; this effect can be prevented by heating the metal before imbedding. The opinion is expressed that the phenomenon is not one of colloidal Ag action, but is rather due to formation on the surface of the metal by atm. O_2 or by H-ion combinations of a compd. whose cytotoxic effect is dependent on its soly. in H_2O .

F. S. HAMMETT

Further studies on the regulation of metabolism in bacteria. F. VEZAR AND J. BÖGGL. *Biochem. Z.* 108, 207-19(1920).—A presentation of curves showing the reactions of *B. coli communis* and other bacteria in various media. The time course of the acid and alkali formation, was studied. In 1% grape sugar a max. acidity is reached. In lower sugar concns. an alkali formation follows the initial acid formation. Differences were observed, however, in the max. acid titrated and in the sugar concns. which lead to alkali formation, after the acid formation in that the limits are lower in both *B. paratyphosus* B. and *B. proteus* $\times 19$, than with *B. coli communis*. *Streptococcus hemolyt.* forms only acid, never alkali. The degree of acidity attained in all cases is independent of the initial acidity or alkalinity observed. The gas formation and gas consumption in grape-sugar bouillon were studied and showed a characteristic course. A comparison of the gas exchange with the acid and alkali formation by *B. coli communis* showed that gas is formed simultaneously with acid, while during alkali formation there occurs a stronger O_2 consumption. No such relation was observed in the case of *B. paratyphosus*. $EtOH$, $MeOH$, $CHCl_3$ and $HCHO$ all retard the metabolic processes in concns. that are much less than the completely inhibiting dose. The alcohols have still another action in distinction to the other poisons. Their poisonous action is summated with that of the acid formed from the grape sugar, so that a lower acid max. is reached when alc. is present.

F. S. HAMMETT

Simple everyday science about yeast. L. K. HIRSCHBERG. *Med. Rec.* 98, 732-3 (1920).—A brief review.

F. S. HAMMETT

The periodic activity of quinine. H. SCHULZ. *Zentr. Physiol.* 34, 415-9(1920).—A study of the question whether changes induced in yeast fermentation by quinine are periodic or not. If the quinine concn. is sufficiently dil. the yeast acts more vigorously than normal; but with certain variable concns. depending apparently upon the inherent vitality of the yeast employed there seems to occur a certain rise and fall of yeast activity that is essentially periodic.

F. S. HAMMETT

Specificity of disinfectants and its bearing on their standardization. A. L. WALTERS. *Lilly Sci. Bull.* 1, 369-76(1920).—The bactericidal value of a compd. depends in large measure upon the species, and even the strain, of the microorganism against which it is used as a disinfectant. Therefore the phenol coefficient with a strain of *Bacillus typhosus* as the standard organism may be entirely misleading. Thus pine oil is considerably more bactericidal than $PhOH$ when acting on the typhoid bacillus, but very much less active than $PhOH$ on the staphylococcus. Hence the

comparative disinfectant value of pine oil and phenol cannot be detd. by any one test.

JOSEPH S. HEPBURN

Effect of the concentration of nitrates on the reducing powers of bacteria. R. W. GLASER. Harvard Univ. *Proc. Nat. Acad. Sci.* 6, 272-4(1920).—The following microorganisms were sown into a Witte peptone medium containing either KNO_3 or NaNO_3 in concns. from 0.0002 molar to 4 molar: *Spirillum melchikovii*, *Bacillus prodigiosus*, *B. coli communis*, *Coccobacillus acridiorum* (2 varieties), *B. anthracis*, *Staphylococcus pyogenes albus*, and *Streptococcus disparis*. After incubation for 5 days tests were made for nitrites with starch, KI and H_2SO_4 and with α -naphthylamine and sulfanilic acid, and for nitrates with phenolsulfonic acid. Only the first 4 species reduced nitrate to nitrite; and the range of concn. of nitrate, within which reduction occurred, varied with the species. Reduction was not influenced by the anion (K or Na) in the nitrate mol. The amt. of growth and the ability to reduce nitrate were not always associated. The anion at times influenced the amt. of growth.

JOSEPH S. HEPBURN

The enzymes of *B. coli communis* which are concerned in the decomposition of glucose and mannitol. IV. The fermentation of glucose in the presence of formic acid. EGERTON CHARLES GREY. Cambridge Univ. *Proc. Roy. Soc. London (B)* 91, 294-305(1920).—Glucose was fermented by means of *B. coli communis* in the presence of Ca formate and chalk; and detn. was made of the amt. of H_2 , CO_2 , HCOOH , AcOH , lactic acid, succinic acid, and alc. formed. The result showed that 3 main groups of products are formed from the glucose: (1) lactic acid, (2) AcOH , alc., and succinic acid, and (3) CO_2 , H_2 , and HCOOH . A closer relation exists between the products of groups 2 and 3 than between either group and group 1. The availability of H is a critical factor; if none be available, succinic acid is formed; with available H, AcOH is produced; and, with still more available H, alc. is formed. Therefore nascent H, produced during fermentation, participates in the formation of the alc. This nascent H may have its origin in the fermentation of the glucose or of the HCOOH .

JOSEPH S. HEPBURN

Coagulating action of staphylococci upon hirudinized plasma. A. GRATIA. *Réunion soc. belge. biol.* 1919, 1393-4; *Physiol. Abstracts* 5, 22(1920).—Staphylococci coagulate hirudinized plasma without neutralizing the hirudin which may be recovered unaltered after the coagulation. The plasma is still anticoagulating, contains neither thrombin nor serozyme, and behaves differently than hirudinized plasma in which coagulation has been produced by addition of thrombin.

JOSEPH S. HEPBURN

Some experiments conducted with pure cultures of bread yeast. WILLIAM F. HENDERSON. James Millikin Univ. *Trans. Am. Microscopical Soc.* 38, 221-8(1919).—In the expts., use was made of glucose, galactose, fructose, sucrose, maltose, and lactose. Glucose and fructose caused yeast to grow much more rapidly than did any of the other sugars. Glucose (and probably fructose) gave rise to the most rapid production of CO_2 . Of the disaccharides, sucrose was most suitable, but did not compare favorably with glucose. While growth of the yeast occurred best under aerobic conditions, development also took place in the proper medium under at least limited anaerobic conditions. For the accumulation of gas in a fermentation tube, it must be produced in amt. sufficient more than to sat. the liquid, and at a rate sufficient to overcome loss by diffusion through the open arm. A solid medium may materially alter the morphological characters of the individual yeast cells by a tendency to localize the food supply.

JOSEPH S. HEPBURN

Equilibrated salt solutions as indifferent suspension fluids for bacteria. MAX ZHUG. *Arch. Hyg.* 89, 175-90(1920).—Bacteria which break down in pure distd. H_2O as well as in 0.85% NaCl can be kept alive for several days in equilibrated salt solns. For staphylococci and proteus bacilli mixts. of inorganic salts can be found which in

certain quant. relations are balanced; the salts are NaCl, KCl, MgCl₂ and CaCl₂. The same salts form a balanced soln. for the vibrio metschnikovii, only CaCl₂ must be substituted with Ca lactate. For the prepn. of these solns. doubly distd. water from glass must be used.

JULIAN H. LEWIS

The course of nitrification in the presence of permutite and carbonates of the alkaline earths. *Centr. Bakt. Parasitenk., Abt. II* 52, 1-8(1920).—The zeolitic properties of permutite have no influence on the course of nitrification. But the content of the culture in carbonate does have a favorable influence. MgCO₃ which is used most in agriculture has the least effect in favoring nitrification. The series of carbonates arranged according to their beneficial action is Cu, Ba, Sr and Mg.

JULIAN H. LEWIS

Changes in acidity or alkalinity of the urine produced by *B. coli* as measured by the final hydrogen-ion concentration. ALFRED T. SHOHL. *J. Urol.* 4, 371-8(1920).—*B. coli* in urine or sugar-free broth reaches a final alk. reaction which is p_H 8.0. If the initial culture is more acid than this, alkali is produced. If more alk., acid is produced. The reaction of the urine is not influenced by infections with *B. coli* when there is no obstruction. In cases showing obstruction, the alk. production from this source must be considered both in diagnosis and treatment.

JULIAN H. LEWIS

The fate of bacteria of the colon-typhoid group on carbohydrate media. O. ISHII. *J. Bact.* 5, 437-40(1920).—Members of the colon-typhoid group are frequently incubated longer than necessary in the study of fermentation reactions, because the cultures die rather quickly in carbohydrate media. The following periods will suffice: *B. coli*, 6 to 7 days; typhoid and paratyphoid, 3 to 4 days; *B. dysenteriae*, *B. enteritidis* and *B. suispestifer*, 5 to 7 days.

JOHN T. MYERS

Preliminary note on the use of some mixed buffer materials for regulating the hydrogen-ion concentration of culture media and of standard buffer solutions. M. R. MEACHAM, J. H. HOPFIELD AND S. F. ACREE. *Syracuse Univ. J. Bact.* 5, 491-9(1920).—One soln. of a mixt. of phosphoric and aspartic acids can be made to give any desired p_H by adding known amts. of alk. and water. Similar results can be obtained by adding varying amts. of acid to the proper mixt. of di-Na or K aspartate and tri-K or Na orthophosphate. More work is in progress in this field. J. T. M.

Bacteriology and its practical applications. A. C. THAYSEN. *Engineering* 108, 574(1920).—T. has shown the applications of bacteriology to certain industrial processes. He begins by pointing out the applications of microorganisms to fermentology. The fermentation of carbohydrates into butyl alc. and acetone is also discussed. He mentions one Admiralty plant which was planned to produce 30 tons of acetone weekly with fermentation tanks of 150,000 gals. capacity dealing with 35 tons of raw material in one fermentation of 35 hrs. duration. He mentions the heat resistance of several bacteria which were encountered. Two lactic acid bacteria were not destroyed by 100° for a short time. In autoclaves of 8,000 gals. capacity at 30° one organism had survived after two hours and was destroyed only after 6 to 8 hours' heating.

F. W. TANNER

Studies of the flocculating yeasts. GOTTFRIED STAIGER. *Univ. Frankfurt a. M. Z. Spiritusind.* 43, 327-8(1920).—Author's abstract of thesis. The literature since 1872 (Dumas) is reviewed. S. worked with 8 races of distillers' yeast, 2 of wine yeast and the bottom-fermenting beer yeast U11. Maltose and dextrose change U11 into a cloudy yeast, but do not affect distillers' yeast X. The critical dose (Barendrecht, *Bull. soc. chim. Belg.*, 1906) of a cloudy yeast, race M, was detd. as follows: 0.1 N H₂SO₄, 0.6-0.8; 0.1 N NaOH, no coagulation; N/30 borax, 4.5; N/30 borax + 10% CaCl₂, 0.8-2.0. When shaken with Et₂O, flocculating yeasts are coagulated, while cloudy yeasts remain liquid. In expts. with 5-liter solns. of various compns., the behavior of various races was observed as follows: wine yeast 1 in malt wort, molasses +

salts and malt wort + malt hulls, lost its flocculation and became cloudy; distillers' yeast X in the same sols., decreased in the size of its flocks but did not become cloudy; yeast X in malt wort + $\text{CaH}_4(\text{PO}_4)_2$ or CaCl_2 retained its character, while with CaSO_4 the flocks became smaller; the same yeast in malt wort + K_2HPO_4 retained its flocculation and increased its yield, while other K and Mg salts led to cloud formation; yeast X in molasses + nutrient salts, with addition of $\text{CaH}_4(\text{PO}_4)_2$, gave better results than with other Ca salts; yeast X in molasses + nutrient salts, with addition of peptone, gave a better yield and flocculation than with asparagine or $(\text{NH}_4)_2\text{SO}_4$. On decanting and filtering, cloudy yeast M retains more water than flocculating yeast X, but on pressing the cake the opposite is true. The flocculating yeasts are in general quite temp.-resistant and are well adapted to bread raising. W. B. V.

CARNEGIE-DICKSON, W. E.: *Bacteriology*. London and Edinburgh: T. C. & E. C. Jack, Ltd. T. Nelson & Sons. 123 pp. 1s. 3d. For review see *J. State Med.* 28, 321 (1920).

D—BOTANY

CARL L. AISBERG

The radioactivity of potassium and its significance in the chlorophyllous and chlorophyll-containing cells. I. JULIUS STOKLASA, with the assistance of J. SEBOR, V. ZDOBNIČKY, E. NAPRAVIL AND J. HROMÁDKO. *Biochem. Z.* 108, 109-39 (1920).—The energy of germination is increased under the influence of the natural radioactivity much more effectively than by an induced or artificial radioactivity derived from Ra emanations as detd. in the emanatorium (not described). Moreover, all the observations made point to the fact that radioactivity is an important factor in vegetative phenomena and that this activity is a property of the minerals, stones, earth and H_2O . Since K is such a high percent factor in plant ashes, S. reports expts. which show that its emanations stimulate the processes of germination to a great degree. II. The mechanism of the physiological action of radium emanations and the radioactivity of potassium on the biochemical processes in the growth of plants. *Ibid* 140-72.—The kinetics of the action of the proteolytic enzymes are stimulated by Ra emanations nearly 50%. Further extensive studies are reported which tend to show that K has a photochemical effect on the growth of plants and that when it is present in large amts. in the chlorophyllous cells of bacteria Ra emanations fail to exert a toxic effect. III. The significance of the radioactivity of potassium in photosynthesis. *Ibid* 173-84. S. continues here to develop his idea that the emanations from the K salts of plants are of great importance to plant life. "The streaming energy of the sun, which acts to synthesize org. materials from inorg. substances in the chlorophyll-containing cells, stands in relation to the β - and γ -rays which are emitted by K. K sends out rays which permeate the entire chlorophyll-containing cell and which certainly contribute to the entire photosynthesis and to the production of org. substances by CO_2 assimilation." F. S. HAMMETT

Factors influencing alkaloidal content and yield of latex in the opium poppy (*Papaver somniferum*). H. E. ANNETT. Agricultural College, Cawnpore. *Biochem. J.* 14, 618-36 (1920).—This is a summary of work which is being published in the *Memoirs of the Dept. of Agric. in India*. The general conclusion is that "morphine in the opium poppy is a useless end product of metabolism. The plant having no mechanism for excreting an end product of such complicated structure stores it in places where it can do no harm to its own metabolism, i. e., chiefly in the capsule. The lactiferous system would seem to represent a means of removing waste products of metabolism." BENJAMIN HARROW

Recent advances in science—plant physiology. R. C. KNIGHT. *Sci. Progress* 15; 200-6 (1920).—Review of recent biochem. work on storage and translocation in plants.

JOSEPH S. HEPBURN

Relation between the osmotic pressure of *Nereocystis* and the salinity of the water. A. M. HURD. *Pub. Puget Sound Biol. Sta. Univ. Washington* 2, 183-93 (1919); *Expt. Sta. Rec.* 42, 131(1920).—The osmotic pressure of *Nereocystis luetkeana* is closely connected with the concn. of the sea water and decreases as the water becomes less saline. This plant is intolerant of a sudden change to fresh water, but can be adapted to the change if the cell sap be given time to approx. the surrounding medium in concn. The normal osmotic pressure in the sap of the plant in normal sea water is 22.72 atm.; this was safely lowered to 12.52 atm. in water 17/28 fresh (the limit of the expt.). The sap had an osmotic surplus of 3.62 atm. throughout the course of adaptation. The lowering of the osmotic pressure within the plant was due to removal of salts and intake of water.

JOSEPH S. HEPBURN

The effect of decreasing the direct action of sunlight at different intervals during the day on the development of the sugar beet. J. K. GREISENEGGER. *Oesterr. Z. Zuckerind.* 256, 1918; *Z. Zuckerind. Cechoslov. Rep.* 44, 238(1920).—The sugar beet develops normally in the shade. Despite a considerable curtailment of the sunlight rays the beets grow with normally developed roots and leaves. The longer the period of shade, the slower the growth. The roots are more affected than the leaves. A decrease in the action of the morning sunlight results in a greater loss in weight of the beet than a corresponding decrease in afternoon sunlight. Both the decrease in the morning and afternoon sunlight hindered relatively the growth of the roots. The greater relative importance of morning sunlight is ascribed to the increased cloudiness during the day and to the late warming of the soil. The relatively larger growth in the leaves of the shaded beets is a possible sign of late ripening due to the lessened action of sunlight. The sugar content of shaded beets is lowered considerably. To a certain extent the purity of the juice is also affected adversely by the shading. The shading from morning sunlight causes a much larger decrease in the yield of sugar than shading from afternoon sunlight.

JOHN M. KRUG

Some aspects of the salt requirements of young rice plants. RAFAEL B. ESPINO. Johns Hopkins Univ. *Philippine J. Sci.* 16, 455-526(1920).—Seedlings of lowland rice were grown for 3 weeks after germination in the following solns. (I) KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$, MgSO_4 . (A) KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$, MgSO_4 , $(\text{NH}_4)_2\text{SO}_4$. (B) KH_2PO_4 , $\text{Ca}(\text{H}_2\text{PO}_4)_2$, MgSO_4 , $(\text{NH}_4)_2\text{SO}_4$. Traces of FePO_4 were added to each soln. The mol. proportions of the salts, and the total mol. concns. were varied. The best concn. is between 0.0016 and 0.0038 total g. mols. per l. (0.08-0.2 atm. osmotic pressure). This is much lower than the best concns. for wheat, buckwheat and soy beans. None of the type I solns. gave good results. Young rice plants seem to require NH_4^+ . The most promising soln. of type A contains the salts in about the mol. proportions: $\text{KH}_2\text{PO}_4:(\text{NH}_4)_2\text{SO}_4:\text{Ca}(\text{NO}_3)_2:\text{MgSO}_4 = 1:1.5:1.5:4$. Certain solns. of type B gave good yields, but in all cases the leaf tips were badly burned. Dry and green wt. of tops, dry wt. of roots and total H_2O absorption furnished valuable criteria for comparing growth, and all are in good general agreement.

T. G. PHILLIPS

The mucilaginous substance of Florideae. EIJI TAKAHASHI. *J. Coll. Agr. Hokkaido Imp. Univ.* 8, 183-232(1920).—The mucilages were extd. from the algae by hot H_2O , and purified by pptn. with EtOH . The highest yield of reducing sugars was obtained by heating the mucilage in a boiling H_2O bath with 10 times its wt. of 3% H_2SO_4 for 14 hrs. The mucilage from *Chondrus elatus* had $[\alpha]_D^{20} = +102.55$. The products of its hydrolysis contained 64.8% reducing sugar (as galactose). The sugars isolated are galactose, arabinose and a new sugar to which the name *floridose* is given. Mannose, glucose and fructose are probably present. Floridose was also isolated from the products of hydrolysis of the mucilage of *Ahnfeltia plicata*. Floridose is fermented by yeast. It gives no test for pentose, Me pentose or ketose. It yields levulinic acid when heated with HCl . Its analysis and mol. wt. correspond to $\text{C}_6\text{H}_{12}\text{O}_6$. Neither

mucic nor saccharic acid is formed on oxidation with HNO_3 . It crystallizes from H_2O in oblong plates sol. in EtOH , m. $152-3^\circ$. It exhibits mutarotation, $[\alpha]_D^{20} = +80.76^\circ$. The following derivs. were prepd.: *phenylhydrazone*, needles, sol. in MeOH , EtOH and hot H_2O , m. $158-60^\circ$; *phenylosazone*, oblong plates, sol. in MeOH , EtOH , insol. in H_2O , m. 193° ; *methylphenylhydrazone*, square plates, m. 191° ; *p-bromophenylhydrazone*, needles, sol. in EtOH , m. $171-2^\circ$. The corresponding alc., *floriditol*, m. $186-7^\circ$. The mucilage of *Gloiopeltis furcata* var. *coliformis* is optically inactive. On hydrolysis it yields 61.3% reducing sugars. Fucose, galactose and arabinose were isolated. Glucose and fructose are probably present. The mucilage from *Iridaea laminarioides* var. *cornucopiae* has $[\alpha]_D^{20} = +7.80^\circ$. It yields 60.6% reducing sugars on hydrolysis. Galactose, arabinose and floridose were isolated. Glucose is probably present, but fructose is doubtful. The mucilages of the Florideae contain no alginic acid, which is present in that of the Laminariaceae.

T. G. PHILLIPS

The effect of zinc sulfate on protoplasmic streaming. HESTER M. RUSK. *Bull. Torrey Botan. Club* 47, 425-33(1920).—Max. acceleration of protoplasmic streaming in *Elodea* was caused by 0.0003 N ZnSO_4 , slight acceleration by 0.0010 N , but 0.0015 N retarded streaming. With *Chara* max. acceleration was caused by 0.0010 N and 0.0020 N had no effect.

T. G. PHILLIPS

The relation between freezing-point lowering, Δ , and specific electrical conductivity, K , of plant tissue fluids. J. ARTHUR HARRIS, ROSS AIKEN GORTNER AND JOHN V. LAWRENCE. *Science* 52, 494-5(1920).—In the vegetation of the glacial moraines of Long Island practically no relationship was found between the concns. of ionized electrolytes and of total solutes in the leaf tissue fluids.

T. G. PHILLIPS

Photosynthesis and hydrogen-ion concentration. J. T. SAUNDERS. *Proc. Cambridge Phil. Soc.* 19, 315-6(1920).—Waters of Upton Broad and contiguous lodes and ditches were tested for H^+ -ion concn. with results varying from 7.65 to 8.6. Water dipped from the center of a mass of *Spirogyra* gave p_{H} of 9.0. *Spirogyra* placed in tap water gave p_{H} 7.2, and on exposure to sunlight gave 8.6 in one hr. and above 9.0 in 2 hrs. *Elodea* gave much the same result. On a dull day the *Spirogyra* did not cause p_{H} to increase. *Spirogyra* killed by heat and placed in water caused p_{H} to fall. Apparently photosynthetic activity of plants in water affects the p_{H} of the water.

L. W. RIGGS

Gaseous exchanges between the root and the atmosphere. RAOUL CERIGHELLI. *Compt. rend.* 171, 575-8(1920).—Expts. were made with plants growing in ordinary soil and those grown in pumice stone moistened with Knop's liquid. The respiration of roots placed in a confined atm. is similar to that of other organs. There is an absorption of O and evolution of CO_2 , the ratio $\text{CO}_2:\text{O}$ varying from 0.7 to 1 according to the species. When roots are in contact with a very moist atm. the amt. of respiration is increased but the ratio $\text{CO}_2:\text{O}$ remains about the same. Roots attached to the rest of the plant and placed in a moist atm. show increased respiration but the CO_2 formed is not completely exhaled, a portion being entrained by the water of the plant and carried to the parts above ground. In this case the ratio $\text{CO}_2:\text{O}$ is much less. C. believes that the CO_2 originating in the root is of more importance to the plant than that dissolved by the soil water and absorbed by the plant.

L. W. RIGGS

Nitrogenous and phosphoric acid materials in the maturation and germination of wheat. EUG. ROUSSEAU AND SIROT. *Compt. rend.* 171, 578-80(1920); *C. A.* 6, 1934; 12, 961, 2029, 2391.—Samples of wheat were collected at intervals of 2 to 4 days beginning June 23 when the grain was very milky with little distinction between its layers, and ending on July 31, 5 days after the harvest. The wt. of 100 seeds increased from 3.0 g. on June 23 to 9.33 on July 11, then fell to 5.80 at the harvest July 26, and to 5.30 on the 31st. Water content dropped from 72 to 12.1% in the 41 days. Acidity as H_2SO_4 fell from 0.3 to 0.015 at the harvest. Total N was quite

constant throughout, the extremes being 2.1 on June 23 and 2.68 on July 3. Sol. N decreased from 1.03 on June 23 to 0.225 on July 11, then increased to 0.341 at the harvest. Total P_2O_5 generally increased from 0.96 on June 23 to 1.03 on July 9, was erratic between 0.92 and 0.98 until July 31 when it stood at 1.01. Sol. P_2O_5 decreased from 0.739 on June 23 to 0.280 on July 11, then increased to 0.35 at the harvest. Analyses were made at the beginning, middle and end of a germinating period of 5 days. Results showed that the acidity increased, total N remained unchanged, sol. N increased from 0.328 to 0.838, total P_2O_5 was slightly decreased and sol. P_2O_5 increased from 0.350 to 0.540.

L. W. RIGGS

Indigenous marine algae (Florideae) for the production of gelose. C. SAUVAGEAU. *Compt. rend.* 171, 566-9(1920).—In the marine alga industry on the Atlantic coast of France the species gathered are *Chondrus crispus* and *Gigartina mamillata*. More than a dozen other species found on the west coast of France and on the French and Algerian Mediterranean coasts were studied and the quality of their gels described. The species of *Gelidium* were abundant, and their exts. in 6% concn. were equal to agar in 16% concn. for gelatinizing beef bouillon. Neither the electrolytes KCl, $CaCl_2$, $(NH_4)_2SO_4$, $Al_2(SO_4)_3$, nor concd. HCl or H_2SO_4 acted upon exts. containing 1 g. of *Gelidium* or *Gracilaria* in 400 to 800 cc. of water. Alc. (95%) did not solidify the ext. Neutral and subacetates of Pb gave a whitish ppt. The action of I soln. (I 1 KI 2, H_2O 200) was generally pronounced and varied with the species. The *Chondrus* and *Gigartina* algae are much less concd. than *Gelidium* in gel-forming constituents, one g. to 25 to 30 cc. of water making a convenient ext. for study purposes. These exts. are sensitive to electrolytes and do not react with I soln. Membrane of certain Florideae and gelation of the gelosic hydrosol. *Ibid* 606-9.—The histologic structure and compn. of tissues of the *Gelidium* group as shown by reactions with the I soln. are described with much detail. It is suggested that the "amyloid" content may have some relation to the gel-forming power.

L. W. RIGGS

The secretion of invertase by plant roots. LEWIS KNUDSON. *Amer. Bot.* 7, 371-9(1920).—Canada field peas (*Pisum arvense* L.) and corn were grown in Pfeffer's nutrient solns. and a study was made of excretion by the roots. When grown in the presence of sucrose an increase of reducing sugars was found in the culture soln. The reaction of the culture soln. was such as to be without influence on the sucrose. It is held that the increase in reducing sugars is due to excretion from the roots.

J. J. SKINNER

Effect of decreasing the direct action of sunlight on the development of the sugar beet (GREISENEGGER) 11D.

E—NUTRITION

PHILIP B. HAWK

NORMAL

The anhydrides of the higher fatty acids as synthetic neutral fats. D. HOLDRE. *Biochem. Z.* 108, 317-23(1920).—A claim for priority in regard to the principle of the oxidation of paraffin and other similar compds. as a step in the method of prepn. of synthetic neutral fats. Three utilization expts. are briefly reported indicating an absorption of the synthetic fats of from 93 to 95%. Cf. *C. A.* 14, 2724.

F. S. HAMMETT

The feeding of normal infants. S. MCLAREN. *Med. Rec.* 98, 765-7(1920).—Plea for a more varied and liberal diet for normal infants at the beginning of the second year. A chart is given.

F. S. HAMMETT

Nomenclature of the so-called accessory food factors (vitamines). J. C. DRUMMOND. *Inst. Physiology, Univ. College, London. Biochem. J.* 14, 660(1920).—The suggestion is made that the final "e" (in vitamine) be dropped, "so that the resulting word vitamin is acceptable under the standard scheme of nomenclature adopted by

the Chemical Society, which permits a neutral substance of undefined composition to bear a name ending in 'in.' Instead of fat-soluble A and water-soluble B, etc., it is suggested that the substances be spoken of as vitamin A, B, etc.

BENJAMIN HARROW

Digestibility of germinated beans. D. M. ATKINS. Royal Holloway College, London. *Biochem. J.* 14, 637-41 (1920).—In 29 expts. the av. increase in nitrogen digestibility—measured by resistance to tryptic activity—of germinated over ungerminated beans was 8.5%. Drying again makes the protein less digestible.

BENJAMIN HARROW

Researches on the fat-soluble accessory substance. III. Technic for carrying out feeding tests for vitamin A (fat-soluble A). JACK CECIL DRUMMOND AND KATHARINE HOPE COWARD. Inst. Physiology, Univ. College, London. *Biochem. J.* 14, 661-4 (1920); cf. *C. A.* 13, 206.—Many conflicting results in the past can be traced to the use of a basal diet not sufficiently free of vitamin A. The caseinogen is heated for 24 hrs. in shallow dishes to 102°, and then subjected to prolonged and continuous extn. with alc. and ether. Rice starch even in the crude form is almost entirely devoid of fat-sol. A. As source of fat, cottonseed oil may be used. Orange juice and salt mixt., and probably the yeast ext., are devoid of fat-sol. A. D. and C. employ the following basal diet: purified caseinogen 18 parts; purified rice starch 52; refined hydrogenated vegetable oil 15; yeast ext. 5; orange juice 5; salt mixt. 5. There should be no considerable increase of body weight in rats 4-5 weeks old (weighing 50-70 g.) when fed upon this diet. Wherever possible a definite weight of the substance under examn. is administered to the animal before the day's ration of the basal food is given. IV. Nuts as a source of vitamin A. KATHARINE HOPE COWARD AND JACK CECIL DRUMMOND. *Ibid* 665-7.—Rats of 50-70 g. wt. were fed on the basal diet described above. The diet was mixed with sufficient cold water to form a stiff paste. Fresh water for drinking and cleaning purposes was supplied daily. The rats were weighed twice a week, and when they had ceased growth and their weight had remained practically stationary for four successive weighings, they were fed daily with approx. 1 g. per rat of the nut to be tested. Among the nuts examd.—Brazil, Barcelona, pea, walnut, almonds and butter nuts—not one showed any appreciable amts. of fat-sol. A, and this despite their relatively large content of fat. "These results furnish additional evidence for the theory that vitamin A is formed in the green part of the living plant and is not stored to any appreciable extent as such in the seed and other resting tissues." V. The nutritive value of animal and vegetable oils and fats considered in relation to their color. JACK CECIL DRUMMOND AND KATHARINE HOPE COWARD. *Ibid* 668-77.—Palmer (*C. A.* 14, 294), in a criticism of Steenbock's work (*C. A.* 13, 3220) relating to the association of fat-soluble A with pigment, pointed out that cottonseed oil, supposed to be rich in lipochromes, is destitute of vitamin. D. and C., in amplification of Palmer's work, selected palm oil, which is deeply colored with lipochrome pigments. Young rats, that were in failing health—due to a diet deficient in fat-sol. A—were given a diet containing 20% of a deeply pigmented sample of palm oil. This addition brought about a striking recovery. D. and C. now tried various animal and vegetable oils. The following is a rough approx. extn. of fat-sol. A content, based on butter as 10: Cod-liver oil, 10; dog-body fat, 6-7; beef fat, 6-8; mutton fat, 2; pig fat, 1; lard, 0; horse fat, 6-8; linseed oil, 1-2; hardened linseed oil, 0; palm oil, 3-4; maize oil, 2-3; cottonseed oil, 1; hardened cottonseed oil, 0; peanut oil, 0; olive oil, 0-1. These results show that though inferior to the majority of animal fats, many vegetable oils do contain appreciable quantities of fat-sol. A, which is contrary to earlier findings by various authors. "Our expts. make it clear, however, that unless we accept the suggestion advanced by Steenbock, of the existence of a leuco compd. of the pigment, to account for the

exceptions, the theory of the association of yellow pigments of the lipochrome class with the presence of vitamin A fails to hold good." (The authors arrived at this conclusion by extg. the amt. of carotin and xanthophyll in each one of their fat samples and comparing such results with the corresponding vitamin content. For example, though dog-body fat showed a vitamin content of 6-7, there were no lipochrome pigments present.) Other expts., not related in detail, lead to the belief that "the nutritive value of a fat of animal origin is dependent on the diet of the animal from which it is derived, and that the food value of either animal or vegetable oils and fats may be considerably affected by the methods of prepn. and refining." Preliminary expts. with cows points to the view "that a diet low in vitamin A brings about a distinct fall in the nutritive value of the milk secreted."

BENJAMIN HARROW

Further study of milk substitute materials in feeding dairy calves. R. E. CALDWELL. *J. Dairy Sci.* 2, 312-29(1919); *Expt. Sta. Rec.* 42, 471(1920).—Young calves were kept on exptl. rations, usually for 12 periods of 10 days each. Ration I contained linseed meal, red dog flour, hominy feed, and liquid beef blood in the ratio 1:1:1:4; ration II contained ground corn, gluten feed, red dog flour, and buckwheat flour in the ratio 5:5:5:3, to this dry mash was added an infusion of clover hay containing 0.1% N. Either alfalfa or clover hay was also fed; and a dry mash of corn and oats was also given to the animals on ration I; limited amts. of milk were fed to all the calves during the first 4 periods. A calf on ration I for the first 9 periods consumed more N, excreted a larger proportion of the ingested N in the urine, and retained a smaller proportion of it than did any of the other exptl. animals; however, the actual amt. of N retained was approx. equal to the av. amt. retained by 2 control calves on a milk diet; 1 part of dried blood was then substituted for the 4 parts of liquid blood in the exptl. ration, the amts. of N ingested and excreted remained unchanged, but excretion was chiefly in the feces; the best gains (av. 1.15 lb. per day) were made by this calf. Another calf, kept on ration II for the first 9 periods, ingested a small amt. of N, retained the smallest amt., and showed a high proportion of the N in the feces after milk was withdrawn from the feed; this calf was given ration I during the last 3 periods, the % of ingested N retained then decreased and the urinary N increased; the lowest gains (av. 0.68 lb. per day) were made by this calf. A milk ration was fed to 2 calves for 8 and 9 periods resp.; they showed a medium consumption of N, retention of a high proportion of the ingested N, and a fair degree of equality between the fecal and the urinary N. Toward the end of the expt., 1 of these calves was placed on ration I and then showed an increase in urinary N, while the other calf was placed on ration II and then showed an increase in fecal N.

JOSEPH S. HEPBURN

Glycogen metabolism in the fetus. B. K. GOGOVERIDZE. Odessa. *Dissertation* pp. 331(1919); *Physiol. Abstracts* 5, 36(1920).—Rabbits were used as exptl. animals; and deta. was made of the distribution of glycogen in the fetus, the placenta, and the uterus and other organs of the mother; some of the animals were given a ration rich in carbohydrates, others were subjected to phlorhizin glucosuria. Disturbed glycogen metabolism in the mother did not influence the fetus. The amt. of glycogen in the placenta and in the decidual cells of the uterus increased during pregnancy and attained a max. on the 10th day, then decreased in the placenta until the 20th or 21st day and in the uterus until the 18th day, and, at the time of parturition, was almost nothing in the placenta, while high in the uterus, especially in the muscles of that organ. With the exception of its muscles, the glycogen content of the fetus was not high, although it increased very rapidly toward the end of pregnancy, attaining its max. at the 27th or 28th day, then decreased to the time of parturition. The amt. of glycogen in the maternal liver decreased as that compd. increased in the uterus and placenta, and also decreased at the time of parturition. The amt. of sugar in the blood also decreased at parturition. Pregnancy, therefore, caused a marked dis-

turbance of the carbohydrate metabolism in the mother. In the transfer of glycogen to the fetus, either by vascular channels or by an immediate inception from glycogen cells by the ectodermal plasmodia, saccharification always occurred. Exptl. hyperglucemia did not interfere with normal pregnancy; neither the uterus nor ovaries became atrophied. Phlorhizin glucosuria was always accompanied by hyperglucemia in pregnant rabbits, and by hypoglucemia in normal animals. J. S. HEPBURN

Alimentation of soldiers in El Chaco. J. A. LOPEZ. *La Prensa Med. (Argentina)* 6, No. 23(1920); *Physiol. Abstracts* 5, 91(1920).—The typical diet in Argentina is composed of meat to a marked degree. During a campaign in 1912 each soldier ingested daily 435 g. protein, 182 g. fat, and 201 g. carbohydrate, giving a total of 4125 cal. JOSEPH S. HEPBURN

The vitamine problem. A. PUGLIESE. *Rend. r. Inst. Lomb. Sci. Lett.* 52, 723-30 (1919); *Physiol. Abstracts* 5, 92(1920).—The conditions produced in animals by a ration of dried grain are not dependent upon the absence of the antiscorbutic vitamin, but are caused by a change in the reaction of the org. fluids, and a resultant demineralization of the organism, especially with respect to P and Ca. J. S. HEPBURN

ABNORMAL

The action of accessory food substances. F. VEZAR AND J. BÖGEL. *Biochem. Z.* 108, 185-206(1920).—This study is a report of the effect of various accessory food materials on blood pressure, intestinal movements, pupillary reaction, glandular secretion and sugar output in dogs rendered diabetic by pancreatectomy. The authors were not successful in demonstrating the presence of compds. in the simple exts. from foodstuffs, such as butter and bran, of sufficient characteristic effect to permit a conclusion as to their action. In general neither in frogs nor in mammals could any toxic effect be obtained. When isolated organs were used as the heart and the intestine, there did occur an increase in contraction, recovery from which, however, was obtained. The alc.-B ext. from bran gave quite regularly a marked vasoconstriction which, however, was not obtained with the H₂O-sol. compd. This speaks against the vasoconstricting substance being identical with the alc. and H₂O-sol. B compd. The A ext. from butter gave regularly a vasodilation which was also observed when the H₂O ext. was used, thus again speaking against the identity of the active principle with the fat-sol. A compd. F. S. HAMMETT

Note on scurvy in pigs. R. H. A. PLIMMER. Univ. Aberdeen. *Biochem. J.* 14, 570-1(1920).—Pigs fed on cooked food, consisting of a mash composed of meals, sharps and turnips, developed scurvy. The animals were cured by giving them the same food but in the raw condition and by increasing the quantity of turnip (yellow Swedes), since these are rich in the anti scorbutic factor. BENJAMIN HARROW

Pathology of cholesterol metabolism. A. KRONOVSKY. *Pub. Kiev. Univ.* 1918; *Physiol. Abstracts* 5, 53(1920).—Long-continued feeding of dried brains increased the amt. of cholesterol in the serum of the horse; the increase was 66% after 28 days on this diet; the internal organs were not modified. In another horse, which was kept on the brain diet and was also immunized by means of diphtheria toxin, hypertrophy of the cortex of the adrenals occurred, also an increase in the amt. of anisotropic lipoids; the same result was produced by immunization alone. J. S. HEPBURN

F—PHYSIOLOGY

ANDREW HUNTER

Remarks on "the permeability of the red blood corpuscles for grape sugar" by M. Bönninger. R. BRINKMAN AND E. VAN DAM. *Biochem. Z.* 108, 74(1920).—Polemical concerning an article by Bönninger (*C. A.* 14, 2656). F. S. HAMMETT

Remarks on the distribution of anions between blood corpuscles and plasma. E. J. WARBURG. *Biochem. Z.* 107, 252-5(1920).—Contrary to the results of Falta and

Richter-Quittner (*C. A.* 14, 2371), W. finds quite the same distribution of Cl and HCO_3 in Hirudin blood as in defibrinated blood, figures for which are presented. *F. S. H.

Remarks on the distribution of glucose between blood corpuscles and plasma.

H. C. HAGEDORN. *Biochem. Z.* 107, 248-9(1920).—Contrary to the results observed by Falta and Richter-Quittner (*C. A.* 14, 2371), in which they failed to demonstrate the presence of glucose in the corpuscles of circulatory blood, H. presents figures as follows:

	Blood.	Plasma.	Blood Corpuscles.	Hemat- ocrit.	B/p.
Normal marf.....	0.87	0.105			
	0.87	0.107	0.068	50.0	64
Normal man fasting.....	0.067	0.076	0.055	42.5	72
	0.068	0.077			
Normal man fasting.....	0.107	0.119	0.090	49.5	81
Same 40 min. after ingestion of 50 g. glucose.....	0.165	0.173	0.156	49.5	91
	0.163	0.169			

F. S. HAMMETT

The distribution of the non-protein nitrogenous compounds between plasma and corpuscles in circulating blood. K. L. GAD-ANDRESEN. *Biochem. Z.* 107, 250-1 (1920).—Polemical concerning the article by Falta and Richter-Quittner. (*C. A.* 14, 2371.)

F. S. HAMMETT

The placental gland and placental extract. S. W. BANDLER. *N. Y. Med. J.* 112, 745-50(1920).—B. argues that, since the processes of menstruation are intimately connected with an established balanced reaction between the endocrine glands and that nidation introduces a new secretion, thus upsetting the balance and causing in the attempt to reach equilibrium many annoying symptoms, the administration of placenta products should tend to an early establishment of a stable condition. He has found that treatment by placental ext. exerts a favorable effect both in pregnancy and in premenstrual disturbance.

F. S. HAMMETT

New aspects of menstruation. J. OLIVER. *N. Y. Med. J.* 112, 751-2(1920).—Seventy ounces of menstrual fluid were collected from a case of imperforate hymen. The fluid was of uniform consistence exhibiting no free fluid or clot. It was faintly alk. of 1.031 sp. gr.: H_2O 87.13%. The solids were 95.02% org. material and 4.98% ash. Serum albumin was 12.49%, serum globulin 16.56%, mucin 3.37% and fat 0.0051%. The inorg. ash contained Na, K, Ca, Mg, P and Fe and the salts present were principally NaCl , Na_2CO_3 , with small amts. of phosphates and sulfates. No iodine could be detected. From this analysis O. is inclined to the secretory conception of menstruation.

F. S. HAMMETT

Effect of subcutaneous injections of thymus substance in young rabbits. A. W. DOWNS AND N. B. EDDY. *Endocrinology* 4, 420-8(1920).—Subcutaneous injections of large doses of desiccated thymus substance, while checking the putting on of weight in young rabbits, did not otherwise impair growth or development and a considerable increase in the weight of the thyroid and spleen was observed.

F. S. HAMMETT

Some conditions affecting thyroid activity. W. S. CANNON AND P. E. SMITH. *Endocrinology* 4, 386(1920).—Gentle massage of the thyroid gland in the cat for two or three minutes causes an increased rate of the denervated heart which occurs even when the adrenal glands are absent and does not occur when the submaxillary is similarly treated. Further evidence demonstrating the linking up of the nervous connections with thyroid activity is given.

F. S. HAMMETT

The hypochrome pigment in blood serum and organs, xanthosis, hyperlipochromemia. HYMANS VAN DEN BERGH AND P. MULLER assisted by J. BROCKMEYER. *Biochem. Z.* 108, 279-303(1920).—It is not always possible to ext. the pigment from blood serum

and tissues by Et_2O alone, but previous EtOH extn. is usually necessary. Brief descriptions of the precautions necessary are given. A quant. colorimetric method is described for detg. the amt. of pigment present based on comparison with $1/24\%$ $\text{K}_2\text{Cr}_2\text{O}_7$ in a Hellige colorimeter, by which rough relative values are obtained. A diet rich in lipochromes causes a determinable increase in the lipochrome of the blood serum and in diabetes high values are frequently observed. In an incomplete series of examns. of the fat, liver, spleen and adrenals of man following various pathol. conditions it was found that the lipochrome content of the different tissues is quite varied. The blood is the poorest in the pigment, and the adrenals are the richest, with the liver, fat, and spleen in the order given. An elective affinity for the pigment is postulated. No correlation could be established between the type of disease and the lipochrome content of the blood or tissues. The results of a comparative study of the distribution of lipochrome in various animals are given. When lipochrome is intravenously injected into rabbits, it is found that the liver can store up the pigment, while the spleen and adrenals are apparently less effective. The significance of the lipochrome pigment is discussed with the possibility that its presence in large amts. may be pathological.

F. S. HAMMETT

Some phases of protein catabolism and fatigue. E. L. SCOTT AND A. B. HASTINGS. *Public Health Reports* 1920, 2445-62 (reprint 617).—The authors examd. the S and phenol content of urine of various workers with the view to obtaining an index of fatigue in industrial workers. Strenuous work tends to increase the nightly output of total S per g. of N; this becomes evident by a comparison with the morning's output. The sulfate S shows a marked increase towards the end of the day; but where the patient remains in bed instead of working, no such change is noticed. "The severity or arduousness of any particular form of labor may be judged by the ratio of the morning to the afternoon sulfate of the urine, provided a sufficient number of detns. have been made upon several individuals." The authors could note no marked change in the output of conjugated phenols, but the output of unconjugated ones increased slightly with moderate work, and greatly with strenuous exercise; thereby suggesting that the free phenol may be a factor in severe fatigue.

BENJAMIN HARROW

Ammonia excretion, amino-acid excretion and the alkaline tide in Singapore. J. A. CAMPBELL. Medical College, Singapore. *Biochem. J.* 14, 603-14(1920).—Previous work (*C. A.* 14, 762) had shown that on many occasions the amt. of NH_3 excreted by the natives of Singapore was high when compared with European standards. This led to the suggestion that climatic conditions—hot, moist and still air—were responsible for the acidosis. In this paper C. further investigates the NH_3 excretion. He shows that the av. hourly NH_3 excreted during the hours of the day when the individuals are most exposed to the effects of the climate is practically the same as that for the whole day. On the other hand, those excreting large amts. of NH_3 were the ones who were most exposed to the climate. Contrary to Leattes (*Brit. Med. J.*, 1919, ii, 165), C. confirms the traditional ascription of the alkaline tide as being due to the secretion of the HCl . The amino acids were estd. by subtracting the result obtained by Folin's method of estg. ammonia from that obtained by Malfatti's method. The amt. of amino nitrogen varied directly with the total nitrogen. When large amts. of ammonia were excreted the amino acids were sometimes increased; at other times they were not altered.

BENJAMIN HARROW

Researches on coagulation of the blood: formation of serozyne in the absence of fibrinogen. J. BORDET. *Réunion soc. belge biol.* 1919, 1139-42; *Physiol. Abstracts* 5, 22(1920).—Oxalated rabbit plasma, which has been carefully centrifuged, is deprived of its fibrinogen by addition of 30% NaCl and centrifugation. The resulting liquid is almost free from cytozyme, and its serozyne is present only as proserozyne; if Ca

salts and a small amt. of cytozyme be added, a progressive transformation of proserozyme to serozyme occurs; this transformation takes place within 1 or 1.5 hrs. after addition of the Ca salts, and is accelerated by the presence of cytozyme or by contact with bare glass, but is not influenced by the presence of fibrinogen. Proserozyme is probably merely serozyme masked by combination with another substance; and cytozyme liberates serozyme from this combination. Cf. C. A. 14, 1845, 1846.

JOSEPH S. HEPBURN

Carbon dioxide: heat ratio in cattle. HENRY P. ARMSBY, J. AUGUST FRIES AND WINFRED W. BRAMAN. Penna. State Coll. *Proc. Nat. Acad. Sci.* 6, 263-5(1920).—In 188 periods of 24 hrs. each, the ratio of the kg.-cal. of heat produced to the g. of CO_2 eliminated by cattle ranged from 2.1500 to 3.1500. In 51 of these periods, data were also obtained for both the standing and the lying positions of cattle; the ratio ranged from 1.8600 to 2.9400 for the standing position, and from 1.6900 to 2.5700 for the lying position. The ratio tended to decrease as the amt. of ingested feed increased. In a series of 99 expts., each of which covered a period of 48 hrs., the influence of the size of the individual animal was eliminated by calcn. of the results per kg. of live wt. Three linear equations were thus obtained, in all of which X represents the g. of air-dried feed ingested per kg. of live wt. (1) The cal. of measured heat per kg. of live wt. equals $0.869X$ plus 14.176. (2) The g. of CO_2 per kg. of live wt. equals $0.455X$ plus 4.365. (3) The ratio of the heat (cal. per kg. of live wt.) to the CO_2 (g. per kg. of live wt.) equals 2.802 minus $0.0226X$. The exptl. animals ate from 5 to 27 g. of air-dried feed per kg. of live wt. If animals are consuming dry feed within these limits and are not performing work, the ratio of heat to CO_2 may be calcd. by equation (3), and the production of CO_2 by equation (2); the heat produced may then be calcd. from these 2 results.

JOSEPH S. HEPBURN

Coagulation of oxalated plasma by staphylococci: transformation of proserozyme to serozyme. A. GRATIA. *Réunion soc. belge biol.* 1919, 1247-50; *Physiol. Abstracts* 5, 22(1920).—Fibrinogen is converted into fibrin by the action, in the presence of Ca salts, of cytozyme and serozyme. Cytozyme exists in the cells and especially in the blood platelets; serozyme exists in the plasma as proserozyme. Staphylococci coagulate fibrinogen without the intervention of the normal agents of coagulation; they secrete thrombin and produce coagulation in plasma which has been rendered free from cytozyme by filtration through a Berkefeld filter, and has been deprived of serozyme by treatment with colloidal $\text{Ca}_3(\text{PO}_4)_2$; coagulation occurs even when the plasma has been subjected to each treatment 3 times. Oxalated plasma is also coagulated by staphylococci without the intervention of the normal agents of clotting. The conversion of proserozyme into serozyme is facilitated by the action of Ca, contact with non-paraffined glass, and presence of cytozyme, and is independent of the fibrinogen.

JOSEPH S. HEPBURN

Thyroid gland. R. K. S. LIM. Univ. Edinburg. *Sci. Progress* 15, 243-9(1920).—Hyperthyroidism, hypothyroidism, the function of the thyroid in the lower vertebrates, the nature of the thyroid secretion, and the function of the secretion of the parathyroids are discussed. The conclusion is drawn that "the function of the thyroid varies according to age. In the young it hastens development, in the adult it maintains the working of the body processes at a normal rate, and in the aged it probably ceases to function."

JOSEPH S. HEPBURN

Relation between the formol nitrogen and the hypobromite nitrogen in the urine. F. PORTES. Montpellier. *Thesis* pp. 79 (1919); *Physiol. Abstracts* 5, 38(1920).—A simple relation exists between N detd. by formol titration, and the N liberated by hypobromites. The ratio of these 2 forms of N in the urine depends on the diet, disease, and other factors. It is 6 on a mixed diet, 4 to 5 on a diet of eggs and vegetables,

3 to 4 on a milk diet, 16 to 18 on a diet high in protein, and is lowered by alk. drinks.

JOSEPH S. HEPBURN

Growth and reproduction in fowls in the absence of carotinoids and the physiological relation of yellow pigmentation to egg laying. LEROY S. PALMER. Univ. Minn. *Proc. Nat. Acad. Sci.* 5, 582-7(1919).—Résumé of studies previously noted. Cf. C. A. 13, 3215-7.

JOSEPH S. HEPBURN

Physiological effects of insufficient oxygen supply. J. BARCROFT. *Nature* 106, 125-9(1920); cf. C. A. 14, 3457.—A discourse.

W. H. ROSS

Viscosity of suspensions of blood corpuscles. E. HATSCHEK. London. *Kolloid-Z.* 27, 163-5(1920).—The results of measurements made by Hess, cf. C. A. 14, 3176, on blood suspensions were recalcd., using the formula derived by Hess for suspended particles that may suffer deformation. The formula is applicable over a wide range of concn. of blood. This may indicate that the corpuscles easily lose their spherical shape during the flow of the liquid.

E. B. SPARR

C—PATHOLOGY

H. GIDRON WELLS

Simplification and partial revision of the factors involved in the complement fixation test for infectious abortion in cattle. CHARLES S. GIBBS AND LEO F. RETTGER. New Haven. *J. Immunol.* 5, 399-416(1920).—The complement-fixation test in infectious abortion is sp., and serves as a valuable method of diagnosis. With the partial revision and simplification of technic described, the method should be thoroughly practical and reliable. The most satisfactory antigen was obtained on agar containing Fairchild peptone and an initial H⁺ concn. of p_H 6.8. The incubation period of the *B. abortus* cultures should not exceed 4 or 5 days, and the stock antigen suspensions should be prepd. immediately following removal of culture tubes from the incubator. Antigen suspensions with a turbidity of 1.75 in terms of the McFarland nephelometer lend themselves readily to direct antigen titration. A practical and economic method of obtaining guinea-pig blood is described. Complement stabilized with 40% of a 12% NaOAc soln. retains its complementary properties for 3 to 4 weeks. Formalinized sheep blood may be used for 3 to 4 weeks as the immediate source of hemolytic antigen in the fixation test. Freshly washed corpuscles from formalinized blood may be used also as antigen for hemolysin production. Positive and negative sera should be used as controls in the final fixation tests.

E. B. FINK

The antigenic properties of globin, with a note on the independence of the properties of serum and tissue proteins, as exemplified by the absence of antibody from the globin of an immunized animal. C. H. BROWNING AND G. HASWELL WILSON. Glasgow. *J. Immunol.* 5, 417-28(1920).—Globin can act as antigen. In addition to 2 antisera for guinea-pig globin, 2 antisera for ox globin have been obtained from rabbits. With these antisera and a number of different specimens of the homologous globins powerful complement-fixation reactions have been obtained. The reaction depends upon suitable quant. relationships between antigen and antibody and also on a suitable H-ion concn. Apparently only certain rabbits respond to injections of globin by the production of complement-fixing antibodies. The injection of globin caused no obvious toxic effects in rabbits. Hemoglobin more rarely leads to antibody production. In certain cases globin shows species specificity; thus the antiserum to guinea-pig globin does not fix complement with ox globin. On the other hand, antiserum to ox globin fixes complement with goat, duck and guinea-pig globin but not with rabbit globin; no explanation is offered of the contradictory behavior of ox and guinea-pig globins in the crossed expts. The results taken together seem to exclude bacterial contamination as the cause. The evidence seems to point to the phenomena being due to a general antibody to globin and not to adventitious protein

contamination. Further recorded facts (namely, that antiserum to guinea-pig globin does not contain hemolytic immune body for guinea-pig corpuscles and does not react with guinea-pig hemoglobin, serum or acid serum albumin, and that guinea-pig globin does not react with antihuman serum) also exclude the probable contaminations which might arise in the course of prepn. of the globin solns. Antibody was absent from the globin of an animal which had reacted to an antigen by the development of powerful serum antibodies.

E. B. FINK

The protective value of pneumococcus vaccination in mice and rabbits. AUGUSTUS B. WADSWORTH. Albany, N. Y. *J. Immunol.* 5, 429-35(1920).—The degree of protection obtained by the use of pneumococcus vaccine was not great considering the quantities of vaccine that were used to vaccinate the animals. The parasitism of such highly virulent cultures is so great that the pneumococci develop in the vaccinated animal just as they grow in a test tube of immune serum. The virulence of pneumococci has been found in previous studies to be largely dependent upon its growth energy or vegetative energy which in the animal tissues constitutes parasitism. E. B. FINK

Serologic relationships of liver and kidney. MOYER S. FLEISHER, T. G. HALL and NATALIE ARNSTEIN. St. Louis. *J. Immunol.* 5, 437-53(1920).—By means of complement-fixation reactions and absorption of sera prepd. against guinea-pig liver and kidney it has been shown that a definite relationship exists between anti-organ sera and homologous antigens. The antigens and antisera are not simple in nature, but complex, and are probably composed of several different partial antigens and immune bodies. These can probably be arranged in 3 groups: The first having a very wide range of activity and having a relationship to all or practically all tissues of the species; the second having a limited range of activity and related only to the tissues used in the prepn. of the antiserum; and the third being possibly a group of antibodies, rather limited in their range of activity, but reacting only or more strongly with individual tissue other than the one used as the immunizing substance. E. B. FINK

The placental transmission of so-called normal antibodies. III. Antilynsins. G. C. REYMAN. Copenhagen. *J. Immunol.* 5, 455-63(1920); cf. *C. A.* 14, 2512; 3273.—A. Anti-megatheriolysin. The titer of the blood of the mother animal follows an av. const.; this also applies to the blood of kids, where the titer in all cases was found to be lower than that of the mother animal, and in the case of twins it was very nearly the same. The titer detns. for the milk were very low. B. Anti-vibriolysin. The titer of the blood is very low and nearly the same in mother and kid. In the 2 cases in which samples of milk were investigated, the amt. of antilynsin was rather great at the parturition, then it decreased rapidly but later increased again in some degree. C. Anti-staphylolysin. The titer of the maternal sera fluctuated rather strongly, but with no definite tendency in either direction. As regards the titer for the kids, it increased in most cases during the first days after birth, but soon afterwards it decreased, after which it remained more or less const. The normal anti-staphylolysin is not always transmitted quantitatively to the young. D. Anti-saponin. The titer of the mother animal remains nearly constant, before as well as after parturition, whereas that of the young increases directly after birth until it reaches a higher point than that of the mother, and then as a rule, rapidly decreases. The saponin-neutralizing power of the milk proved slight and offered no support for the supposition that this influenced the content of these bodies in the blood of the kids. E. B. FINK

A serological study of cholera immunity. I. Agglutinin. ROKURO UMEMURA. Tokyo. *J. Immunol.* 5, 465-88(1920).—Agglutinin begins to come down at the time when the serum proteins begin to ppt. by the addition of $(\text{NH}_4)_2\text{SO}_4$ and is completely pptd. at 4.6 to 4.8 satn. Therefore, agglutinin is present in both euglobulin and pseudoglobulin and never in either exclusive of the other. It is present also in fibrino-

globulin, but not in albumin. There is a uniform relationship between the agglutinin and the protein substances in all animals (horse, goat and rabbit). E. B. FINK

The value of the intrapalpebral mallein test in the diagnosis of glanders. EDWARD H. MASON AND R. V. B. EMMONS. *J. Immunol.* **5**, 489-97 (1920).—The complement-fixation test is of greatest value, it being positive in 75% of 94 horses examd. The agglutination reaction ranks next, confirming a suspicious mallein with a definitely positive reaction in 44% of the cases in the same series. It is, therefore, concluded that the complement-fixation reaction is of the greatest benefit in confirming a doubtful intrapalpebral mallein test, but that this reaction should be considered in conjunction with an agglutination test, one to act as a check upon the other. E. B. FINK

Renal function: a determination of its degree. J. B. LEATHES. Univ. Sheffield. *Lancet* **1920**, II, 933-5.—A clinical test is described which is based upon the ability of the kidney to excrete H_2O and NaCl as measured by the hourly output during the night. The diuretic alkalinity test was designed to test the behavior of the kidney in respect to its regulatory functions. Patients with severe nephritis showed either no diuresis or no alkaline tide; either of these abnormalities by itself; or both together. The cases clinically most seriously affected almost always showed both abnormalities.

E. B. FINK

Experiments with cerebrospinal fluid. J. E. R. McDONAGH. London. *Lancet* **1920**, II, 991-4.—Shaking a spinal fluid with toluene, xylene or benzene the day after it is withdrawn will enable one at once to det. whether the lesion is degenerative or not. This test will be still further confirmed by testing another portion of the fluid with $HCHO$ before it is shaken with a hydrocarbon. The various proteins merge into one another; there is no hard and fast line between albumin and globulin, and globulin and lipid-globulin. The differences between them are physical rather than chemical. The complement-fixation test is regulated by the ions on the surface of the protein mols.—their number and elec. charge. The gold-sol test is dependent upon the presence of certain protein particles (lipoid-globulin) which have a prevailing positive elec. charge on their surface. The gold-sol. test carried out with distd. H_2O will readily serve to distinguish a normal fluid from a fluid from a case of degeneration, because the latter only will ppt. the colloidal gold and in the first few tubes only. This may be confirmed with the fluid pipetted off from the hydrocarbon emulsion, because only those fluids from cases of widespread degeneration will ppt. colloidal gold. A diminution of the pptn. of colloidal gold in the first tube when the fluid has been treated with acetic acid indicates degenerative encephalitis (general paresis). This may be confirmed by the slight pptn. which occurs in fluids which have been treated with NH_3 and allowed to rest before being tested and which is only met with in cases of degenerative encephalitis. The lipoid-globulin particles simulate parasites in certain ways and those found in the spinal fluid in degenerative cases are waste products which have reached the fluid by ultrafiltration through the choroid plexuses. Treating a normal spinal fluid and serum with an acid makes the protein particles therein approach as near as possible to those usually met with in syphilis.

E. B. FINK

The pathogeny and metabolism of diabetes insipidus, with especial attention to the chemical study of the blood. H. GOEKE. *Arch. Verdauungs krankh.* **26**, 365-97 (1920).—An extensively reported study of the amt., sp. gr., Δ , NaCl, and N of the urine detd. simultaneously with the protein, NaCl and mol. concn. of the blood serum under various exptl. conditions in cases of diabetes insipidus. The polyuria is mainly conditioned by the inability of the kidney to excrete NaCl and salts in the normal concn.. In these cases there occurs a marked hyperchloremia and a decided lowering of the f. p., e. g., a hyperosmosis. The addition of NaCl leads to its increase in the blood and is an additional stimulus to diuresis. H_2O retention in the body is, how-

ever, possible but it is of a low grade, while the excretion of the additional NaCl is slightly retarded but is complete by the next day. When the body is made, salt-poor, the hyperchloremia and hyperosmosis diminish, but the normal values of the latter are not reached, and although the diuresis is also diminished excretion is still extraordinarily high. Fever has but a slight effect on the diuresis and inhibition of H₂O intake makes the body H₂O-poor as shown by increased viscosity of the blood and loss of wt. while not notably diminishing the diuresis. The only means by which the concn. capacity of the kidneys can be increased for a time is the subcutaneous or intravenous injection of hypophysis ext. which causes a decrease in H₂O output; an increase in mol. concn. and excretion; a reduction of the hyperchloremia, a decrease of the lowered f. p. towards the normal and a lessened protein in the blood serum. However, no significant H₂O retention in the body follows the use of hypophysis ext. for the excretion can be swung from the kidneys to other channels such as the skin, etc. The lessened diuresis and increased concn. of the excreted urine are proportional to the amt. of ext. administered, and closely repeated injections of *pituglandol* can cause complete anuria for 9 to 12 hrs.

F. S. HAMMETT

Subacute and chronic digestive disturbances in diarrhea. M. BRANDER'S. *Arch. Verdauungs krankh.* 26, 399-429(1920).—Mainly of clinical interest.

F. S. HAMMETT

Stalagmones of urine. H. BECHHOLD AND L. REINER. *Biochem. Z.* 108, 98-108 (1920).—Stalagmones are defined as characteristic substances occurring in urine which lower its surface tension and are associated with certain diseases (tuberculosis, pregnancy, carcinoma, nephritis, icterus, pyelitis, severe infections). Ultrafiltration expts. show that they are colloid, or rather semi-colloid, and that they do not belong to any particular grade of dispersion. They are very stable when their dispersion is considered. The detn. was carried out by the usual stalagmometric methods, the results of which are given in brief tables. It was found that different stalagmones or groups of stalagmones are active in different diseases. When albumin is excreted this is an important factor, and in urines in icterus the bile constituents are active. In the greater number of the cases so far studied the lowering of the surface tension is parallel in some degree to the coloration of the urine, but apparently is not caused by urochrome, but by other protein derivs., such as albumoses, peptones, oxypoteic acid, etc., the stalagmometric index of which was detd.

F. S. HAMMETT

The chemistry of the blood in anemic conditions. F. ROSENTHAL AND P. HOLZER. *Biochem. Z.* 108, 220-34(1920).—A series of detns. was made of total cholesterol, free cholesterol, cholesterol esters, and I number of blood serum in pernicious anemia, anemia of carcinoma, hemolytic jaundice and splenomegaly. Similar studies are reported of spleens from various sources. No characteristic differences in the blood-serum compn. from non-anemic patients could be found. After splenectomy in man, in spite of the actual improvement, the unsatd. fat content of red blood corpuscles and serum was not ostensibly influenced; nor does the spleen in cases of severe anemia contain increased amts. of I-combining fatty acids. The red blood corpuscles in pernicious anemia are free from cholesterol esters, but there is no lowering of the cholesterol content of the spleen paralleling the marked fatty atrophy. In lipid nephrosis the red blood corpuscles may participate in the characteristic infiltrative processes of the cholesterol esters and in cholesterolemia free and bound cholesterol is present in normal proportion.

F. S. HAMMETT

The anencephalic syndrome in its relation to apituitarism. F. J. BROWNE. *Edin. Med. J.* 25, 296-307(1920).—The anencephalic syndrome is summarized by a mal-development of the basis cranii, protruding eyeballs and tongue, aquilinity of nose, large amt. of subcutaneous fat, hyperplasia of thymus, small or absent adrenals, genital hypoplasia and stunted growth of trunk and limbs. These appearances are all

discussed and the conclusion is drawn from the constancy of the changes and the fact that they so closely resemble the dystrophia adiposo-genitalis produced experimentally or by disease, that the internal secretions of the mother play no part, or at most a very minor one in the development of the fetus; seeing that they seem to have no effect in compensating for the secretions that are wanting in a anencephaly. It is evident also that the endocrine glands of the fetus itself play an extremely important part in its development in utero. No constant changes were observed in the thyroid and pancreas.

F. S. HAMMETT

Classification of disorders of the hypophysis. WM. ENGELBACH. *Endocrinology* 4, 347-65(1920).—A detailed classification embracing both clinical and biochem. evidence of pituitary disorders.

F. S. HAMMETT

Studies on the disorders of the thyroid gland. II. Further experiences with the epinephrine hypersensitiveness test with especial reference to "diffuse adenomatosis" of the thyroid gland. E. GOETSCH. *Endocrinology* 4, 389-402(1920); cf. *C. A.* 14, 2219.—In a group of border line cases suspected of hyperthyroidism, but not showing increased basal metabolism, the epinephrine hypersensitiveness test is positive and examn. of removed thyroid tissue shows certain histological changes that G. has named "diffuse adenomatosis."

F. S. HAMMETT

Hypopituitarism. H. H. LISSNER. *Endocrinology* 4, 403-7(1920).—Report of a classical case of hypopituitarism in child of 23 months. Low sugar tolerance was observed.

F. S. HAMMETT

Pathogeny of diarrhea. E. EGAN, P. KLEMPERER AND R. STRISOWER. *Z. exp. Path. Ther.* 21, 182-212(1920).—Serological studies of diarrhea yielded 60% of cases with positive agglutinin reactions, which points to a bacteriological etiology of the disorder.

F. S. HAMMETT

The nature of the Wassermann reaction. I. The Wassermann reaction and the lipase content of the cerebrospinal fluid. H. E. LORENZ. *Z. exp. Path. Ther.* 21, 228-41(1920).—Tables and charts are presented showing the relation between the lipase and lymphocyte content and the Wassermann reaction in the cerebrospinal fluid. The results of the studies of either diseased or induced disturbances of the lipid-rich tissues indicate that a positive Wassermann is related to the lipid metabolism, which in turn is connected with an increased lipase content. It is improbable that the lymphocytes of the cerebrospinal fluid are the carriers and hence the cause of the positive reaction.

F. S. HAMMETT

The manner of action of the vaccination therapy in typhus and other febrile infectious diseases. O. LÖWY. *Z. exp. Path. Ther.* 21, 242-51(1920).—L. by his expts. on guinea pigs comes to the conclusion that the action of the vaccine therapy in typhus is in no way specific either in the production of immune bodies or in anaphylaxis. It is rather a reaction on the heat centers and by means of a summation of fever-exciting substances the temp.-regulating center becomes fatigued and the temp. sinks to or below normal. The length of time this reduction of temp. persists is attributable to many factors, among which the leucocytes play an important role.

F. S. H.

Heat inactivation of diphtheria antitoxin. ANNIE HOMER. *Biochem. J.* 14, 565-9(1920).—Adding NaCl (1-2%) to plasma before heating the latter, does not reduce the heat inactivation of the antitoxin. The rate of heat inactivation depends upon the temp. This and previous papers by the author lead her to the following general conclusions regarding the extent of the denaturation of proteins: it is a function of (a) the temp. at which the heating is conducted, (b) the reaction of the plasma, and (c) the duration of the heating of the plasma.

BENJAMIN HARROW

Acrodyia. WILLIAM WESTON. *Arch. Pediatrics* 37, 513-22(1920).—It is possible, but not certain, that this disease, which is characterized by swelling and intense irritation of the hands and feet, is a food deficiency disease.

JOSEPH S. HENFURNY.

Meningitis, caused by lead poisoning in a child of nineteen months. ROBERT A. STRONG. *Arch. Pediatrics* 37, 532-7(1920).—A fatal case of meningitis, due to chronic Pb poisoning, occurred in an infant of 19 months who had ingested Pb paint on 2 occasions by biting it from the rail of the bed. Both the urine and the cerebrospinal fluid gave a negative result when tested for Pb. Examin. of the cerebrospinal fluid showed serous meningitis. Chronic Pb poisoning was shown by the presence of stippled erythrocytes (Grawitz's granules) in the blood, the blue lead line on the gums, and other symptoms. "The well recognized fact that Pb is capable of affecting the central nervous system and the absence of any infection justifies the conclusion that the meningitis was due to the Pb poisoning."

JOSEPH S. HEPBURN

Focal hemorrhagic encephalitis. ALBERT SMEDRS ROOT. *Arch. Pediatrics* 37, 538-44(1920).—In this disease, a moderate leucocytosis occurs; blood cultures are negative; the cerebrospinal fluid is clear and under either slight or considerable pressure, and shows an increase in its content of albumin and globulin, and a normal reduction of Fehling soln.; its cells are largely mononuclear, may attain a count of 100 at the beginning of the disease, but usually show a low count (5 to 25) at its later stages.

JOSEPH S. HEPBURN

Renal calculus. LOUIS RENE KAUFMAN. *Hahnemannian Monthly* 55, 593-610 (1920).—Includes the urinary findings in several cases of this disease.

JOSEPH S. HEPBURN

Diabetes insipidus in a baby. S. NARIGAWA. *Zikwa Zasshi* No. 213, 16-26 (1918); *Jap. Med. Literature* 5, 14(1920).—Neither the renal function nor the blood pressure was disturbed. When pituitary ext. was injected in doses of 0.29 cc., the vol. of the urine decreased, and the concn. of its NaCl increased; and the baby improved.

JOSEPH S. HEPBURN

Antigen of a specific hemolysin. T. TAKOHATA AND G. IWAI. Fukuoka Univ. *Fukuoka Ikwasagoku Zasshi* 6, No. 5, 27(1918); *Jap. Med. Literature* 5, 18(1920).—The substances in the erythrocytes, which fix the hemolysin of immune serum, are easily destroyed by drying, heat, sunlight, protease, acids, alkalies, compds. which ppt. proteins, and certain solvents.

JOSEPH S. HEPBURN

Urea and non-protein nitrogen content of the organs after bilateral ligation of the ureters, after nephrectomy, and after experimental toxic nephritis in the rabbit. S. IUDA. Fukuoka Univ. *Fukuoka Ikwasagoku Zasshi* 6, No. 5, 25-6(1918); *Jap. Med. Literature* 5, 18(1920).—In the normal animal, the urea was approx. uniformly distributed throughout all the organs and fluids of the body; non-protein N was present in all the organs and fluids, but in relatively larger amts. in the muscle, liver, kidney, intestine, lung and heart, and in smaller amts. in the brain and blood. When secretion of urine was prevented, both the urea and the non-protein N accumulated, but their relative distribution in the various organs and fluids corresponded to that in the normal animal; the accumulation was proportional to the duration of the anuria. No differences could be detected between the results produced by nephrectomy and those given by ligation of the ureters. The ratio of urea to non-protein N varied irregularly in the different organs under normal conditions, but became approx. the same in all the organs where retention occurred; and the numerical value of this ratio became less, the greater the retention. Retention also produced an increased water content in the intestine, kidney, lung, heart and muscle, but not in the brain and liver. The liver of a rabbit, which had been made uremic in any one of these three ways underwent autolysis somewhat more rapidly than the liver of a normal rabbit.

JOSEPH S. HEPBURN

Positive Wassermann produced by red iodide of mercury. JOHN G. WURTZ. Pittsburgh Homeopathic Hosp. *J. Am. Inst. Homeopathy* 13, 320-4(1920).—Rabbits, which gave a negative Wassermann test, were given homeopathic triturations of red

HgI₂ by mouth daily for several months; the blood serum of each animal was subjected weekly to the Wassermann test, using both the acetone-insol. antigen prepd. from beef heart, and also the cholesterolized alcoholic ext. of beef heart antigen. Of 6 rabbits which received the third decimal triturate of HgI₂, 2 gave a 75% positive Wassermann reaction with the cholesterolized antigen, 2 gave a transient 25% positive reaction, and 2 yielded only negative results.

JOSEPH S. HEFBURN

Excretion of bile pigments in experimental nephritis. W. NONNENBRUCH. *Mitt. Grenzgebiet. Med. Chirur.* 31, 470-2(1919); *Physiol. Abstracts* 5, 44(1920).—In exptl. nephritis, produced in dogs by administration of U, Cr, or HgCl₂, bilirubin increases markedly in concn. in the blood, and also passes into the urine. J. S. HEFBURN

Protein partition in horse serum before and after immunization with diphtheria toxin. K. SAKAGUCHI, I. HAYASHI AND B. TANABE. *Mitt. Med. Fak. Univ. Tokyo* 20, 427-38(1918); *Physiol. Abstracts* 5, 52(1920).—After immunization, the total N, total protein, and globulin had increased, and the albumin had decreased in the serum. No direct connection existed between the increased globulin content and the anti-toxin content of the serum. JOSEPH S. HEFBURN

Action of metallic colloids upon diphtheria toxin. LE FÈVRE DE ARRIC. *Réunion soc. belge biol.* 1919, 1143-4; *Physiol. Abstracts* 5, 50(1920).—Separate injections of diphtheria toxin and metallic colloids into living guinea pigs did not protect the animals. Colloidal Au and Pt had no action on the toxin *in vitro*. Colloids of Fe, and especially those of Mn, visibly reduced the activity of the toxin with which they had been mixed *in vitro* for 1 hr. prior to injection of the mixt. *in vivo*; this attenuation of the toxin is attributed to the oxidizing power of a colloidal soln. of Fe and Mn, and its mechanism is compared to that of a diastase or of an oxidizing catalyst. JOSEPH S. HEFBURN

Study of a traumatic pleural exudate from the viewpoint of the coagulation of the blood. A. GRATIA. *Réunion soc. belge biol.* 1919, 1395-7; *Physiol. Abstracts* 5, 22(1920).—Normally a traumatic pleural exudate, obtained by puncture, remains liquid, since it is defibrinated blood and contains none of the elements required for coagulation (fibrinogen, cytozyme, serozyme, thrombin). It contains large amts. of anti-thrombin, and, after heating to 56°, flocculates fibrinogen. If the exudate be coagulable *in vitro*, either it contains blood which has freshly passed from the wound as a result of too deep a puncture for evacuation, or else the exudate has not clotted in the cavity on account of protection by the serous endothelium which has formed a scar.

JOSEPH S. HEFBURN

Hypercholesterolemia in nephritis, and the influence of diet upon it. HANS BREUMER. *Archiv. f. Kindheilk.* 68, 104-17(1920).—In severe and mild forms of acute hemorrhagic nephritis there is no increase in serum cholesterol. A slight increase may occur after the subsidence of the acute stage. Nephroses are often associated with a marked increase in serum cholesterol, independent of edema, albuminuria and fever. Dietary control with fat- and lipid-poor food, offers no prospects of success.

LOUIS LEITER

The oxygen consumption of normal and cancerous mouse tissues *in vitro*. B. R. G. RUSSELL AND W. E. GYE. *Brit. J. Exptl. Path.* 1, 175-83(1920).—The rate of O consumption rises with the increasing speed of growth, and more O is used by tumors which are more highly differentiated.

LOUIS LEITER

Glandular adipose tissue: Its relation to other endocrine organs and to the vitamine problem. W. CRAMER. *Brit. J. Exptl. Path.* 1, 184-95(1920).—In all types of mammals which have been investigated there exists a glandular type of adipose tissue histogenetically distinct from ordinary adipose tissue. It is shown that this tissue, which is very vascular, is functionally distinct from ordinary adipose tissue. The fatty material which it contains is rich in cholesterol compds. and other lipoids in addition to ordinary true fat. This load of lipoids is retained under conditions which

bring about the disappearance of the ordinary adipose tissue. Evidence is given that it is functionally related to the thyroid and adrenal glands, especially to the cortex of the adrenal. If vitamins are completely withheld from the diet the lipoids disappear from the adrenal cortex and from this tissue. This fact throws fresh light on the problem of the deficiency diseases. It is proposed to call this glandular type of adipose tissue the "lipoid gland" or "cholesterol gland." LOUIS LEITER

The value of simultaneous testing for the Wassermann reaction with two different antigens and the "ice-box method." T. J. MACKIE AND C. C. ROWLAND. *Brit. J. Exptl. Path.* 1, 219-25(1920).—The sensitiveness of the Wassermann reaction as here described can be increased, especially in early primary and treated cases by testing simultaneously with a liver lecithin plus cholesterol antigen and a heart ext. plus cholesterol antigen. The ice-box modification as applied to the method described does not confer any appreciable advantage over the usual procedure of incubating the mixt. of antigen, serum and complement at 37° for 1.5 hours. LOUIS LEITER

The respiratory exchange of surviving mouse tissues, normal and neoplastic. B. R. G. RUSSELL AND W. H. WOGLOM. *Brit. J. Exptl. Path.* 1, 244-56(1920).—Respiratory quotients were obtained for surviving normal and tumor tissue of the mouse by suspending emulsions in alveolar air in the Barcroft blood-gas app. The results agreed very closely in successive expts. with each normal tissue. Greater variability was found with tumor tissue. The tentative conclusion is drawn that the more rapidly growing, undifferentiated tumors draw their energy from carbohydrate, the more slowly growing from fats. LOUIS LEITER

Variations in the benzidine-peroxidase reaction depending on fixative, physiological activity and type of animal. M. L. MENTEN. *Brit. J. Exptl. Path.* 1, 225-36(1920).—The Graham benzidine-peroxidase reagent, consisting of a 0.5% soln. of benzidine in 75% alc. plus 0.2% H₂O₂ produces a yellow-brown color in the granules of myelogenous cells in human blood and is diagnostic for man. The polymorphonuclear leucocytes of blood of lower animals studied differ from those of human blood in their reaction to the Graham reagent in that only a small percentage of them develops the characteristic color. These positively reacting cells are probably eosinophilic. In a 0.5% soln. of benzidine in 75% alc. free from H₂O₂ practically all of the myelogenous cells of the guinea pig, dog, white mouse, white rat and rabbit give the characteristic colored granular reaction. Addition of H₂O₂ to this soln. tends to inhibit the development of the yellow color, which disappears from all except 1 or 2 cells when the concn. of the H₂O₂ is increased to 1%. LOUIS LEITER

The influence of precipitin on toxin-antitoxin mixtures. M. V. EISLER. *Centr. Bakt. Parasitenk., Abt. I* 84, 46-60(1920).—A neutral mixt. of toxin and antitoxin is affected by precipitin. The toxic effect on the toxin depends on its nature and the age of the toxin-antitoxin mixt. Tetanus toxin which has a weak avidity for its antitoxin is freed by pptn. if it is allowed to act within 15 min. after neutralization of the toxin. After 3 hrs. the union is permanent. An example of strong avidity of toxin for its antitoxin is diphtheria toxin and the hemotoxin of the vibrio Kadi-Kjö. These toxins cannot be freed by precipitin 1/2 hr. after neutralization. Nevertheless, after this period precipitin affects the combination of toxin and antitoxin in that the toxin is easily sepd. with acid. After 1/2 hr. of neutralization a 50% satn. with (NH₄)₂SO₄ does not free toxin. Treating tetanus antitoxin with HCHO does not affect the action of precipitin on the antibody. JULIAN H. LEWIS

Inactivation of toxin. O. Löwy. *Centr. Bakt. Parasitenk., Abt. I* 84, 61-4(1920).—El Tor V-Toxin is made inactive through the action of pepsin, trypsin, bolus alba, 1:5000 permanganate, by guinea-pig liver, spleen, kidney, brain, fresh or boiled and by rabbit spleen, liver, kidney and brain. Formalin and a 0.4% soln. did not affect the toxin in 15 min. Dysentery toxin is inactivated by perhydrol and by rabbit

intestinal mucosa even if this is heated 60° for 15 min. The following have no effect: trypsin, pepsin, ptyalin and papayotin, formalin in 10 min. and permanganate 1:1000, rabbit brain, liver, pancreas, spleen, kidney, mucosa of the vermiform appendix, stomach and large intestines and by boiled small intestine mucosa. Diphtheria toxin is inactivated by pepsin, ptyalin and permanganate. It is markedly weakened by trypsin. It remains active in spite of the action of adrenaline (1:2500), perhydrol, formalin, charcoal, kaolin, cholesterol, guinea-pig brain, liver, spleen, kidney, heart and skeletal muscle, bone marrow, adrenal, and rabbit brain, liver, heart, spleen and kidney. Tetanus toxin is inactivated by trypsin, ptyalin and adrenaline and remains active in spite of the action of papayotin and pepsin.

JULIAN H. LEWIS

The influence of complement of infected guinea pigs on the Wassermann reaction. K. HINTZE. *Centr. Bakt. Parasitenk., Abt. I* 84, 65-71(1920).—The complement of healthy guinea pigs, which produces hemolysis quickly and with a high titer, inhibits hemolysis when the guinea pig is infected with pseudotuberculosis. It is necessary, therefore, to prevent errors in the Wassermann reaction, to make a careful autopsy when blood is taken from a guinea pig. The complement of healthy guinea pigs varies and should be titrated with a known negative serum before use.

JULIAN H. LEWIS

Lysis of tubercle bacilli with specific immune serum. BAATZ. *Centr. Bakt. Parasitenk., Abt. I* 84, 81-8(1920).—A sp. lysis of tubercle bacilli in the tuberculous organism, as in the classical Pfeiffer's phenomenon, was not observed. The biologic method of Kraus and Hofer for differentiation of acid-fast bacteria is impracticable. The significance of bacteriolysis in tuberculosis immunity is not understood.

JULIAN H. LEWIS

The Weil-Felix reaction and the agglutination of proteus X-19 with specific immune serum. CARL PRAUSNITZ. *Centr. Bakt. Parasitenk., Abt. I* 84, 103-7(1920).—The blood of man immunized with killed cultures of proteus X-19 contains agglutinins which are not affected by heating to 56° for 1 hr. The same procedure greatly weakens the agglutinins in typhus. These facts serve as a means of differentiating the 2 kinds of serums and at the same time it shows that the mechanism of the production of the Weil-Felix reaction is not the same as that for sp. agglutinins.

JULIAN H. LEWIS

Properties of the blood serum of people receiving antirabic treatment. J. KOSTRZEWSKI. *Centr. Bakt. Parasitenk., Abt. I* 84, 107-14(1920).—Complement-fixation tests show that more antibodies against rabies are formed in the Pasteur treatment than in the Högyes diln. method. The condition of immunity to rabies is directed not only against the virus but also the toxins from normal as well as virus-containing spinal cord. The Pasteur treatment is better also for this reason. Antibodies were demonstrated by the complement-fixation test in the serum of vaccinated people immediately after treatment and by animal expt. they appeared 7 days after treatment.

JULIAN H. LEWIS

The influence of specific sera on the flagellate stage of cultured amebae. W. VON SCHUCKMANN. *Centr. Bakt. Parasitenk. Abt. I* 84, 304-13(1920).—Immune serum obtained with the H V strain of amebae agglutinated not only the H V amebae, but also the flagellate stage of this strain, with paralysis of the flagellae and inhibition of development into the ameba stage. The development from amebae into flagellates was suppressed. All other strains of amebae or flagellates were not affected with this antiserum. In contrast to this, immune serum obtained with M I amebae not only affected M I amebae and flagellae but also those of the H VI and St. II strains. The H V strain is probably of one species and H VI, M I and St. II of another.

JULIAN H. LEWIS

The value of multivalent extracts in the serodiagnosis of glanders by means of the complement-fixation test. W. PFELER AND FR. GRAFE. *Centr. Bakt. Parasitenk.,*

Abt. 84, 451-9(1919); cf. *C. A.* 15, 118.—More positive reactions are obtained than with a univalent one.

JULIAN H. LEWIS

Serodiagnosis of syphilis by means of the Sachs-Georgi precipitation method. AMMENHAUSER. *Centr. Bakt. Parasitenk., Abt. I* 84, 521-8(1920).—The chief drawback in the Sachs-Georgi reaction for syphilis is the antigen, but, as in the Wassermann reaction where the antigen question is unsolved, useful results can be obtained with the use and comparison of several antigens. A. places the Sachs-Georgi reaction as equal to the Wassermann reaction in its usefulness for diagnosing syphilis.

JULIAN H. LEWIS

Colloid investigations with cerebrospinal fluid and the use of congorubin for this purpose. H. LUKRS. Munich. *Kolloid-Z.* 27, 177-82(1920).—The use of colloidal Au and mastic solns. in testing the cerebrospinal fluid of patients having syphilitic-cerebrospinal meningitis is outlined and an extensive bibliography is given of the work published on this subject. Both of these colloidal solns. are too sensitive to the action of electrolytes on the one hand and toward protective colloids on the other. Moreover, it is difficult to prep. two samples of colloidal Au, for example, so that their properties may be nearly identical. L. proposes the use of congorubin solns. as a substitute for Au or mastic for the above mentioned purpose, because the former exhibit these disadvantages to a much less degree. An account is given of expts. with the cerebrospinal fluid of normal and diseased adults. Acids, bases and even neutral salts occasion a color change in congorubin solns. which is retarded by the presence of protective colloids. A much greater retardation is caused by the cerebrospinal fluid of a patient having the disease in question, than by the corresponding fluid of a normal adult. Sp. directions are included for the prepn. and use of congorubin solns.

E. B. SPEAR

Epinephrine content of the suprarenal glands in anaphylaxis. MAURICE I. SMITH AND S. RAVITZ. Univ. Nebraska. *J. Exp. Med.* 32, 595-600(1920).—The epinephrine store of the suprarenal glands remains unaltered in guinea pigs and rabbits which have been sensitized to ox serum, or subjected to varying degrees of anaphylactic shock by the reinjection of the foreign protein.

C. J. WEST

Contributions on the histogenesis of xanthomas. M. H. CORTEN. Municipal Katharine Hospital of Stuttgart. *Frank. Z. Path.* 33, 389-404(1920).—There are epithelial xanthomas according to Corten. The xanthoma cell is only the picture of a condition, and this occurs through the infiltration of different cells with cholesterol containing fat mixts. For this cellular disposition or a heightened content of cholesterol is necessary, and this latter occurs either through a hypercholesterolemia or through a purely local cholesterol deposit. The cells most disposed to this xanthomatous change are immature or undifferentiated cells, as endothelial, young connective tissue and tumor cells.

R. P. WOLF

German medicinal agents (LUMIÈRE) 17.

DIGBY, K. H.: Immunity in Health. The Function of the Tonsils and other Subepithelial Lymphatic Glands in the Bodily Economy. London: Henry Frowde and Hodder & Stoughton. 130 pp. 8s. 6d. net. For review see *Nature* 106, 177 (1920).

H—PHARMACOLOGY.

ALFRED N. RICHARDS

The chemo-therapeutic action of some dyes against bacterial infections in the animal experiment. F. NEUFELD, O. SCHIEMANN AND BAUMGARTEN. Koch Inst., Berlin. *Deut. med. Wochschr.* 46, 1013-5(1920).—Acridine compds. (trypaflavine and one containing a Me group less) were used against exptl. pneumococci and chicken cholera infections. The protection against pneumococci was very marked. Attention is called to the so-called "contrary effect," that is, the infection pro-

ceeds more rapidly with than without these substances. Dilns. in which trypanflavine arrests the growth of various bacteria are given. The effect of the acridines on other infections, such as anthrax, melitensis, diphtheria and streptococci, was tested. Particularly in the latter case mice were saved from a 10 times fatal dose. Considerable curative effect was obtained in infections with bacilli of Asiatic cholera in guinea pigs and mice. The acridines were given intraperitoneally as late as 90 min. after infection. Other dyes were tried *in vitro*. Crystal violet, methyl violet, brilliant green and dahlia (Grueblez) showed elective action against anthrax. Dahlia acted much more on staphylococci than on streptococci. Quinoline red was active against cholera. With some of these substances animal tests were made. S. AMBERG

The indications for the salvarsan treatment of syphilis and the treatment with silver salvarsan. W. SCHLÖRZ. Univ. Königsberg. *Deut. med. Wochschr.* 46, 879-81(1920).—Silver salvarsan did not offer any definite advantages in the treatment of syphilis. S. AMBERG

The therapeutic use of trivalin. W. MAASS. *Deut. med. Wochschr.* 46, 884-5 (1920).—Trivalin-Overlach is a fluid containing in 1 ml. 0.01935 g. morphine valerate, 0.0037 g. caffeine valerate and 0.00506 g. cocaine valerate. It proved of advantage particularly in morphine cures. S. AMBERG

The theory of chemo-therapeutic activity. (On the basis of experiments with acridinium dyes). H. LANGER. *Deut. med. Wochschr.* 46, 1016-6(1920).—Trypanflavine is diaminomethylacridinium chloride. "Flavizid" (Agfa) is 2,7-dimethyl-3-dimethylamino-6-amino-10-methylacridinium chloride. It contains more methyl groups than trypanflavine; it diffuses much less rapidly through gelatin. It kills staphylococci and diphtheria bacilli in much greater dilns. The disinfecting power of a semicollodial substance increases with increasing colloidal character within certain limits. Some interesting but thus far rather speculative ideas with regard to internal disinfection are developed. S. AMBERG

The use of diuretics in kidney diseases. F. HIRSCHFELD. *Deut. med. Wochschr.* 46, 995-6(1920).—Diuretics can produce diuresis in cases of nephritis when the diet is poor in protein. They may diminish the urine secretion when the diet is rich in protein. The poorer the functional capacity of the kidneys the lower the protein content of the food which permits a favorable action of diuretics. S. AMBERG

Treatment of puerperal sepsis with fulmargin. F. ARON. *Deut. med. Wochschr.* 46, 968-9(1920).—Fulmargin is a colloidal Ag prep. obtained electrically without protective proteins. It seemed to be of service in some cases of puerperal sepsis. It is given intravenously with great care. In the tissues it causes irritation and infiltration. S. AMBERG

Unusual cause of a number of nitrobenzene intoxications in infants. A. EWER. *Deut. med. Wochschr.* 46, 1078-80(1920).—Five infants became severely ill from absorption of nitrobenzene through the skin from cloth which was stamped, after washing, with dye containing this compd. S. AMBERG

Clinical researches on hydrated colloidal ferric oxide. LUIGI DOZZI. *Gazz. ospedali clin.* 41, 182-6(1920).—Expts. on the intravenous injection of colloidal Fe_2O_3 in the treatment of anemia. The author gives the following method of prep. of the soln. used: 100 g. FeCl_3 are dissolved in H_2O and made up to 100 cc.; 100 cc. of this soln. are then diluted with 230 cc. H_2O , heated to boiling, and 0.5 N [Dozzi uses the word "soda." This would scarcely be NaOH in a physiological preparation. No formula is given. The carbonate is most probable.—H. W. B., 3d.] Na_2CO_3 is cautiously added with continuous stirring until a permanent ppt. is formed. NaCl is then added to bring the total concn of that salt to 0.9%. The resulting soln. with a concn. of Fe_2O_3 of about 1:1000 is bright red in color, very stable, and can be sterilized in a Koch sterilizer. Preliminary expts. with rabbits showed no ill effects and the study

was continued on human subjects. With adults injections of 5-15 cc. were used, the total amt. administered being 15-30 cc. over a period of several days. The total amt. in the case of children was 10 cc. Excellent results were observed, increase in body weight and general health as well as increase in the red cell count. As very small doses produce very marked results, the author regards the action of Fe_2O_3 as a "stimulus" to the production of red cells rather than as a direct source of Fe. The prepn. is tolerated perfectly, no attending symptoms being observed other than the great improvement of the anemic patient. 22 references to the literature of colloid therapy (especially Fe) are given. H. W. BANKS, 3RD.

The biochemistry of drug addiction. A. S. HOROVITZ. *N. Y. Med. J.* 112, 585-6(1920).—A speculation. F. S. HAMMETT

Hemorrhagic syndrome cured by thyroïdin. L. P. BOTTARO AND J. C. MUSSIO FOURNIER. *Endocrinology* 4, 366-8(1920).—Report of case where thyroid administration relieved the hemorrhagic conditions. F. S. HAMMETT

The pharmacology of drugs used in disease of the upper gastro-intestinal tract. W. A. BASTEDO. *Am. Med.* 26, 417-27(1920).—A review. F. S. HAMMETT

The use of various therapeutic agents for reducing the hydrochloric acid in gastric ulcer, with particular attention to the physiology of the hydrochloric acid secretion. G. KELLING. *Arch. Verdauungskrankh.* 26, 287-50(1920).—An extensive presentation of expts. and discussion from which it is concluded that dietary regulation is the best method for reduction of the amt. of HCl in cases of gastric ulcer. The foods should be in liquid or semi-liquid form when ingested, and meat, meat exts., spices and alcohol, acid and CO_2 -containing drinks are excluded. The use of milk is advocated as relieving the painful effects of the HCl. NaCl should be cut to the lowest limit. Adsorbing materials such as talc, blood charcoal and kaolin are of little use. $\text{Bi}_2(\text{CO}_3)_3$ is of all the Bi preps. the best, but it should be given in large doses and before eating. The neutralizing substance must be chosen from the point of view of the time taken to empty the stomach, and where the pylorus is easily patent NaHCO_3 is preferable, and in light cases alk. mineral waters. Where retarded evacuation occurs MgO is the better neutralizing agent, while H_2O_2 is very energetic in retarding the HCl and increasing the mucus secretion. Fe preps. increase the HCl secretion. Apparently the formation of the HCl depends on electrolytic dissociation and osmotic processes. F. S. HAMMETT

Fatal post-arsphenamine jaundice. A. S. HYMAN. *N. Y. Med. J.* 112, 496-8(1920).—Although the post-mortem and clinical study of this subject point incriminatingly toward the arsphenamine as the lethal factor, the story is not a clear-cut one either of acute or chronic As poisoning, inasmuch as the dose given (about 122 mg.) is considered too small to have produced the results reported. F. S. HAMMETT

Simple study for physiological practice. M. A. VAN HERWERDEN. *Zentr. physiol.* 34, 413-4(1920).—*Daphnia* is suggested as an excellent material for use in the physiol. study of the action of various chemicals on heart rhythm and rate. A few expts. are briefly outlined in which the acid reaction of the polyp poison of *Hydra* is demonstrated under the microscope, etc. F. S. HAMMETT

Pharmacodynamic subepidermal tests. II. Indirect tests. A, thyroïdin. M. ASCALI AND A. FAGIVOLI. *Endocrinology* 4, 387-8(1920).—The reaction following the subepidermal injection of adrenaline is enhanced and protracted if to the adrenaline used (1:100,000) 0.01 to 0.005 cc. thyroid ext. be added. The same activation may be demonstrated in the case of pituitrin instead of adrenaline. F. S. HAMMETT

The physiological action of silicic acid. Its action on the animal organism. F. SCHUBAUER. *Biochem. Z.* 108, 304-8(1920).—When Na_2SiO_3 free from NaOH is fed to white mice for periods of from 2 to 3 weeks they die. Since the alimentary tract shows epithelial destruction the opinion is expressed that the disturbances are due to

the hydrolytic splitting off of free NaOH in the intestine, which in turn destroys the mucosa. The action is first evident in the duodenum and can be abolished by neutralization of the silicate.

F. S. HAMMETT

The physiological action of silicic acid. Its absorption. FR. BREEST. *Biochem. Z.* 108, 309-16(1920).—B. confirms the preceding study that the toxic effect of Na_2SiO_3 in large doses is not due to the SiO_2 , but to the NaOH contained therein. Feeding expts. on white mice showed that the SiO_2 content of the body can be increased but that only a small part is retained by the normal organism. The passage of the silicic acid through the acid stomach does not affect the forms in which it is fed alike. The hydrate of silicic acid is not absorbed.

F. S. HAMMETT

Tissue storage of guaiacol and pyrocatecholacetic acid. JURGENS. *Z. exp. Path. Ther.* 21, 213-5(1920).—Tabular presentation of the results of qual. tests for Na salicylate, K pyrocatecholacetate and guaiacol, in various tissues of the body after their administration in various doses. It was found that the blood always contained the drugs in considerable amts. The kidneys came next in relative amt. and frequency of positive reaction. The joints more than the muscles appeared to have a selective affinity for the salicylate, but the respiratory organs also contained not a little. Guaiacol was always found in the respiratory organs but never in the muscles or joints. Similar findings in general were obtained with K pyrocatecholacetate.

F. S. HAMMETT

Contribution to the biology of the lymphocytes. S. BERGEL. *Z. exp. Path. Ther.* 21, 216-27(1920).—B. injected almond oil, neat's-foot oil, emulsified lecithin, and 10% lecithin in oil soln. into the abdominal cavity and other places and studied the leucocytic reaction. Since the emigration from the cells was almost entirely lymphocytic, while within the contiguous blood vessels many poly-morpho-nuclear-granular-leucocytes were evident which had not emigrated, the conclusion is reached that this is the first demonstration that has definitely and conclusively proved the chemotactic elective action of injected substances on the lymphocytic elements of the blood.

F. S. HAMMETT

Membranes and narcosis. II. Comparative conductivity determinations on narcotized muscle and connective tissue membranes. P. SCHULZE. *Biochem. Z.* 108, 1-34(1920).—Studies were made on the membranes of the *musculus transversus* and *rectus abdominis* and the *ligamentum patallae* of *Esculenta* and *Temporaria* submitted to narcosis with alc., CHCl_3 , Et_2O , urethan, and isopral, in which as an index of permeability the electrical resistance of the tissue under the various conditions was used. As an expression of the relative differences obtained the following table is given representing the mean of the values observed.

Narcotic.	Musc. transv.	Musc. rectus.	Lig. pat.
Alcohol.....	+6.17%	+4.75%	+0.1%
CHCl_3	+1.0%	+1.20%	+2.0%
Et_2O	+7.30%	+5.30%	+3.6%
Urethan.....	+4.20%	+8.80%	+2.70%
Isopral.....	+3.6%	+6.8%	+0.61%

Twenty-four charts are appended

F. S. HAMMETT

Pharmacology of cotton root bark. CHARLES R. ECKLER. *Lilly Sci. Bull.* 1, 349-68(1920).—Tests of the physiol. activity were made on samples of the root bark from 13 different samples of the cotton plant collected at flowering, also on a number of samples of com. root bark, both green and dried. In a few cases, large doses produced a very slight bluing of the cock's comb; this method usually yielded indefinite and unsatisfactory results; and, as a rule, no decided differences could be detected between any of the samples examd. A very slight and transient pressor effect was produced on the blood pressure of the dog; a depressor effect, or else no effect, was

obtained on the intact cat. The spinal prepn. of the dog showed a pressor followed by a depressor effect, that of the cat gave only a depressor effect. No decided difference between any of the samples was found by the blood pressure method. The com. samples were also tested with the *isolated* guinea pig uterus and with the *intact* uterus of the cat and of the rabbit *in situ*; no decided difference between any of the samples was shown by these tests; rather large doses produced small contractions of the uterus in these expts. All the methods showed that the activity of cotton root bark was not comparable to that of ergot.

JOSEPH S. HEPBURN

Mechanism of fever reduction by drugs. HENRY G. BARBOUR AND JULIAN B. HERRMANN. Yale Univ. *Proc. Nat. Acad. Sci.* 6, 138-9 (1920).—A mild fever was produced in dogs by subcutaneous injection of a suspension of killed colon bacilli. The following day the exptl. animals were given certain antipyretic drugs in doses of 0.2 to 0.5 g. per kg. of body wt.; Na salicylate, quinine-HCl, and antipyrine were administered subcutaneously, acetylsalicylic acid by mouth. The drugs were also given to normal dogs as controls. The sugar content of the blood was increased by the drugs in both fevered and normal dogs; it rose from an av. value of 0.137% in 13 normal dogs to an av. max. of 0.186% after administration of the drug, and from an av. value of 0.139% in 10 fevered dogs to an av. max. of 0.218% after administration of the drug. In the fevered dogs the antipyretics also produced a diln. of the blood (shown by a decrease in % of hemoglobin) and a fall in body (rectal) temp.; this diln. of the blood or plethora promotes dissipation of heat both by radiation (peripheral vasodilation) and by evapn. of water from the surface of the body.

JOSEPH S. HEPBURN

Action of nicotine upon skeletal muscle. KWANICHIRO OKUSHIMA. *Acta Schol. Med. Univ. Imperial. Kioto* 3, 151-67 (1919).—Nicotine produces in skeletal muscle of the frog fibrillary twitchings, tonic contractions, and vibrating twitchings on single shocks by induction. Since these phenomena do not occur in totally curarized muscles, they must be due to a stimulating action of nicotine on the motor nerve-termination app. They are dependent on the amt. of nicotine and the period of its action, become less marked as poisoning progresses, and may not appear when very high concns. are used. In very dil. concns., nicotine exerts a stimulating action on the peripheral motor app., so that on indirect stimulation the degree of twitching is increased, and, in the early stage of poisoning, the stimulation wave is also lessened. With increasing concn. of the poison, this action disappears; on the other hand, the stimulation wave and the fatigue become greater, and the twitching less prominent. All these actions are not noted after curarization. After poisoning for 1.5 hr. with a 0.1% soln., the muscle no longer responds to an indirect stimulus, although it still responds normally to direct stimulation. Nicotine acts on the true muscle substance, first as a stimulant, but finally produces paralysis. The amt. of nicotine required to produce action by the muscle itself is much greater than that required to produce action by the nerve ending. Nicotine is able to a certain degree to retard or to prevent the paralyzing action of curari.

JOSEPH S. HEPBURN

Aspirin and Crataegus: further studies. A. E. HINSDALE. Ohio State Univ. *J. Am. Inst. Homeopathy* 13, 311-2 (1920).—When a satd. soln. of aspirin in Ringer soln. was applied directly to the myocardium of the turtle heart, the heart rate was appreciably slowed, decreasing from a normal of 101 to 74 within 5 min., and to 66 a few min. later; the tone was increased; and the heart action became irregular within 6 to 8 min. after the application of the aspirin; the systole was slightly prolonged, and relaxation during diastole became imperfect. When a soln. of 0.01 grain of atropine in Ringer soln. was applied to the heart, which had been treated with aspirin, the irregular action immediately ceased; the increased tonus was no longer noticeable, and the heart almost completely recovered its normal functions. Hence atropine is

an antidote to aspirin. Application of the non-alcoholic homeopathic tincture of *Crataegus* directly to the turtle heart very appreciably slowed that organ and also increased its tone. The heart finally stopped beating; application of atropine to the heart muscle at this point exerted an immediate and progressive antidotal effect, restoring the original rate, amplitude and frequency of the cardiac excursions.

JOSEPH S. HEPBURN

Partial provings of benzol, iodine, and kali bichromicum. R. F. RABH AND F. H. HIRSCHLAND. *New York Homeopathic Med. Coll. J. Am. Inst. Homeopathy* 13, 499-504(1920).—Administration of the 6th, 12th and 30th decimal dilns. of $K_2Cr_2O_7$ to guinea pigs with the food finally produced death; among the symptoms were dilation of the stomach, acute gastritis, and lesions of the kidney. The homeopathic tincture of I, given *per os*, produced intense inflammation of the gastro-intestinal tract, pulmonary edema, parenchymatous inflammation of the kidneys, and death of the exptl. guinea pig. Benzene had no apparent influence on a rabbit when administered in doses of 10 drops twice daily; it slowed the blood stream and thereby caused the formation of infarcts when given to guinea pigs in doses of 4 to 6 drops 3 times daily. Administration of C_6H_6 (1st to 30th decimal dilns.) to men and women caused a decrease in the number of erythrocytes and an increase in the number of white cells. The urine was increased in amt.

JOSEPH S. HEPBURN

Novocaine as a skin irritant. ARTHUR E. GUPTELL. *Dental Cosmos* 62, 1460-1 (1920). The soln. of novocaine, which is used for the production of infiltration anesthesia, may act as an irritant to the skin if it come in contact with the latter. Characteristic lesions are produced.

JOSEPH S. HEPBURN

Chronic poisoning from cyanogen chloride. C. I. REED. *J. Ind. Hyg.* 2, 140-3 (1920).—The clinical pictures of poisoning in man by CNCl and by the more common cyanides, and the results obtained by expts. on animals (dogs and goats) with both CNCl and more common cyanides are similar. The chronic effects of CNCl poisoning in man (*e. g.*, in workmen engaged in its manuf.) are due to chronic cyanide poisoning, but certain of the symptoms may be due to the presence of Cl. The chronic symptoms produced by CNCl poisoning are more severe than those caused by the more common cyanides. Severe symptoms produced by a single large dose of the common cyanides may not be followed by any chronic symptoms, while a single large dose of CNCl may cause death as a termination of chronic symptoms.

JOSEPH S. HEPBURN

Experimental researches on the mode of action of oxalates, citrates, and tartrates. SHOHEI HARA. *Acta Schol. Med. Univ. Imperial. Kioto* 3, 213-32(1919).—The toxicity of the Na salts of oxalic, citric and tartaric acids does not run parallel to their ability to ppt. Ca salts. Therefore they must exert a specific action in addition to their pptn. of Ca. The detoxicating action of $CaCl_2$ does not run parallel to the soly. of the Ca salts formed. The power of these acids to intensify the action of Mg corresponds to their power to ppt. Ca, and probably is due to a change, produced by them, in the equil. between the ions of Ca and those of Mg.

JOSEPH S. HEPBURN

Mercurial poisoning in the manufacture of clinical thermometers. WILLIAM JACOBSON. *J. Ind. Hyg.* 2, 193-6(1920).—An account is given of the manuf. of clinical thermometers, and of the precautions required to prevent the occurrence of mercurial poisoning among employees of that industry. Two cases of such poisoning are described; Hg occurred in the urine of 1 patient, and in the feces but not in the urine of the other patient.

JOSEPH S. HEPBURN

Some unusual phenomena attending the use of homatropine as a cycloplegic. JOSEPH V. F. CLAY. *Hahnemannian Monthly* 55, 690-2(1920).—A detailed account of unusual, marked systemic disturbances produced in man by instillation of 1 drop of a soln. of homatropine-HBr (4 grains to the oz.) into each conjunctival sac, followed by a second instillation 15 min. later.

JOSEPH S. HEPBURN

Use of propyl alcohol in relation to health. ANON. *Vierteljahr. ger. Med.* 58, 1-3(1919); *Physiol. Abstracts* 5, 48(1920).—Although propyl alc. is used in the prepn. of foods as a preservative, and in the manuf. of medicines and cosmetics, and is approx. twice as toxic as ethyl alc., yet no ill effects have been recorded for the amts. present in the substances mentioned.

JOSEPH S. HEPBURN

Cadmium poisoning. G. ARBOUR STEPHENS. *J. Ind. Hyg.* 2, 129-32(1920).—Examn. was made of the livers of 8 workmen who had been employed in Zn-smelting works and had suffered from the occupational disease of that industry. Each lb. of liver contained from 0.094 to 0.91 grains Cd, from 0.03 to 0.77 grains Zn, and merely a trace, if any, Pb. Workmen in this industry are exposed to the fumes of Cd, which accompanies the Zn in the ore and is driven off in the first distillate, and may absorb these fumes. When suffering from industrial poisoning, their symptoms are atypical of Pb poisoning, but are similar to those produced by administration of Cd to exptl. animals.

JOSEPH S. HEPBURN

The toxic action of pyro- and meta-phosphoric acid. OSKAR LOEW. *Arch. Hyg.* 89, 130-4(1920).—By a comparison of the toxic action of the salts of pyro- and meta-phosphoric acids with fluorides and oxalates on animals and bacteria which contain and do not contain Ca it is concluded that the toxicity of pyro- and meta-phosphoric acids is due to the withdrawal of Ca from the cells.

JULIAN H. LEWIS

A study of the antiseptic action of certain local anesthetics. I. Antiseptic action of local anesthetics against Staphylococcus and B. coli. DAVID I. MACHT AND Y. SATANI. *J. Urol.* 4, 347-55(1920).—The effects of a no. of local anesthetics were studied on *Staphylococcus aureus* and *B. coli* by 3 different methods. It was found that some of the drugs, notably cocaine and novocaine, possess no antiseptic powers whatever, while others, notably apothesis and benzyl alc., exhibit distinct antiseptic effects. These findings are deemed to be of interest not only in relation to healing of wounds, but also in respect to a direct effect on the flora of certain organs, notably the bladder and urethra. II. A study of the antiseptic action of benzyl alcohol and other local anesthetics against the gonococcus. ERNEST O. SWARTZ. *Ibid* 355-61.—The germicidal value of certain concns. of a no. of local anesthetics was detd. The solns. were of the same strength as those commonly used in clinical work. Solns. of β -eucaine have no antiseptic nor germicidal action against gonococcus. α -Eucaine solns. are antiseptic but not germicidal for the gonococcus. Holocaine, alypine, apothesis and benzyl alc. are both antiseptic and germicidal for the gonococcus.

JULIAN H. LEWIS

Pharmacology of chelidonine, a neglected alkaloid of Chelidonium or tetterwort. P. J. HANZLIK. *J. Am. Med. Assoc.* 75, 1324-5(1920).—This drug is obtained from the root of *C. majus*, and its action resembles those of papaverine and the benzyl esters. It has relatively low toxicity, and causes depression and narcosis without subsequent excitation of the central nervous system, differing in this respect from morphine. It slows the pulse, lowers the blood pressure by cardiac depression, relaxes smooth muscle in all regions and depresses skeletal muscle without influencing the nervous connections. Being obtained from a weed growing in the U. S., it offers an economic advantage over papaverine, which is at present virtually unobtainable. It is also more palatable than the benzyl esters.

L. W. RIGGS

New class of hypnotics: dialkylhomophthalimides. AUGUSTE LUMIÈRE AND FELIX PERRIN. *Compt. rend.* 171, 637-9(1920).—By treatment of homophthalimide with C_2H_5I in the presence of C_2H_5ONa the H of the CH_2 group is replaced yielding *diethylhomophthalimide*, colorless leaves, m. p. 144. By a similar method the *ethyl-propyl*-, *dipropyl*- and *diallyl*-comps. were prepd.; these melt at 117, 128 and 140-1° resp. These derivatives are sol. in KOH and NaOH and are pptd. from their solns. by NH_4Cl ; they act as hypnotics, are of slight toxicity, and appear to be without

unfavorable secondary actions. The diethyl derivative has the strongest hypnotic action of the 4 compds. studied.

L. W. RIGGS

Activation of protoplasm. J. VOIGT. Göttingen. *Kolloid-Z.* 27, 175-7(1920).—Controversial questions are taken up as to the reactions that occur when colloidal solns. of protein bodies are injected intravenously or subcutaneously in the treatment of certain diseases such as typhus and rheumatism of the joints. It is not yet possible to decide definitely whether the reactions between the injected substance and the constituents of the blood are purely colloidal, such for instance as coagulation, pptn. or whether the total result is an activation of the protoplasm, whereby the general tone of the patient is raised and consequently the chances of recovery enhanced.

F. B. SPHAR

Local anesthetic actions of saligenin and other phenylcarbinols. A. D. HIRSCHFELDER, A. LUNDHOLM AND H. NORRGÅRD. Univ. Minn. *J. Pharmacol.* 15, 261-70 (1920).—See C. A. 14, 3719.

C. J. WEST

The effect of high temperature upon the action and toxicity of digitalis. ARTHUR D. HIRSCHFELDER, J. BICEK, F. J. KUCERA AND W. HANSON. Univ. Minn. *J. Pharmacol.* 15, 427-31(1920).—See C. A. 14, 3719.

C. J. WEST

Treatment of pulpless teeth. PERCY R. HOWE. Harvard Univ. *J. Nat. Dental Assoc.* 7, 853-9(1920).—Includes a description of the sterilization of tooth structures by means of ammoniacal Ag₂O followed by either HCHO or eugenol.

JOSEPH S. HEPBURN

German medicinal agents (LUMIÈRE) 17. Poisonous gases from carbon tetrachloride fire extinguishers (FIELDNER, *et al.*) 18.

I—ZOOLOGY

R. A. GORTNER

Recent work on the influence of the ductless glands upon amphibian metamorphosis. LANCELOT T. HOGGEN. *Sci. Progress* 15, 303-6(1920).—Review devoted chiefly to the influence of the thyroid; some attention is also paid to the parathyroids, thymus, pituitary and pineal glands.

JOSEPH S. HEPBURN

Egg-laying reactions in the pomace fly, *Drosophila*. EDWARD F. ADOLPH. Harvard College. *J. Expt. Zool.* 31, 327-41(1920).—*D. melanogaster* laid an av. of 0.05 egg per day, per female when placed in dry glass containers. The odor of AcOH + EtOH gave nearly the same av. number of eggs, while moisture gave a higher value (0.18). When allowed to taste glucose + H₂O, or to smell and taste Et₂O the values were slightly higher (0.20 and 0.21 egg per day for each fly). Texture as exemplified by boiled agar greatly augmented the egg-laying response, the value being 0.77. Texture and odor combined as obtained with boiled agar and EtOH again caused more than a 3-fold increase to a value of 2.7. Finally a combination of texture, taste and odor obtained with fermenting banana, gave the highest figure, 3.3. The human senses were used as an arbitrary means of detg. the properties of the substances employed. The concn. of the odorous substances had no influence on the response except in the case of toxic substances where it was great enough to produce death. The internal factors responsible for the production of eggs were discussed and the importance of nutrition and vivacity for the production of eggs was noted while the extrusion of the eggs was especially favored by copulation and the spasmodic activity of the ovipositing organs. "The egg-laying response in *Drosophila* may be considered diagrammatically as being caused by a succession of stimuli. The prerequisites are adequate nutrition and sexual maturity, at least. The eggs, having been produced within the body of the female, are not deposited without the presence of certain sensory qualities such as touch, smell and taste. No single quality produces a response at all comparable to the amount of egg laying in nature; but combinations of moisture,

texture, and odor call forth egg laying of the same magnitude as that under optimum natural conditions. Egg laying in its nature is a complete response ('all or none'); that is, partial stimulation cannot be measured. A single potent factor in the chain may never lead to the extrusion of eggs."

CHAS. H. RICHARDSON

The control of breeding of yellow fever mosquitoes in ant-guards, flower vases and similar containers. JAMES ZETEK. Board of Health Lab, Ancon, Canal Zone. *J. Econ. Entomology* 13, 344-50(1920).—The use of *p*-dichlorobenzene and camphor is recommended.

C. H. R.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Opinions on food control. A. BEHRE. *Chem. Ztg.* 44, 701-2, 709-10(1920).—A criticism of food control as practiced in Germany, including a discussion of the extension of the activities of the food control chemist to the field of nutrition, political economy and hygiene as well as to the art of food manuf. and knowledge of raw materials.

H. A. LEPPER

Determination of sweetness of artificial sweeteners. R. PAULI. *Die Umschau* 24, 592(1920).—Two solns. of substance, 1 stronger and the other weaker in sweetness than a sugar soln. (e. g., 2% sucrose) are prepd. Prepare 7 others ranging between these and differing by equal quantities. Comparison is made between the solns. and the sucrose soln. Several tests must be made on each pair (the sucrose as well as each soln.), after the series is turned about, to insure freedom from chance and usual errors, such as personal equation. The use of bread, wine and H₂O between comparisons of test soln. and standard is recommended.

H. A. LEPPER

A review of the subject of milk: The "harmonie" of this food. CH. PÖRCHER. *Bull. soc. hyg.* 8, 463-86(1920).—A discussion of the "harmonie" of milk (the adaptation of its component parts to each other) with respect to its origin, use and compn.

H. A. LEPPER

The relative value of the methylene blue reduction test, the bromothymol blue test and the bromocresol purple test in determining the keeping quality of milk. E. G. HASTINGS AND AUDREY DAVENPORT. *J. Dairy Sci.* 3, 353-66(1920).—Study was made of the methylene blue reduction tests previously studied by H. (C. A. 15, 128 of the bromothymol blue test of Cooledge and Wyant (C. A. 14, 1585, 2386), and of the bromocresol purple test of Baker and Van Slyke (C. A. 14, 301) as tests to det. the keeping qualities of milk judging from the bacteria content. The methylene blue reduction test is preferable because it measures the no. of bacteria while the first named of the other two measures the acid formed by the milk bacteria seeded in broth by means of *p_H* and the second measures the acid formed by the change in color of the indicator after a period of incubation. The changes produced in broth by milk bacteria seeded therein will not be the same as those in the milk, so that the method based on this procedure is not believed to be very valuable for judging the keeping quality of milk. The other method is not one whereby milks still commercially valuable, i. e., those in which no appreciable acidity has developed, can be differentiated into a no. of groups. The methylene blue reduction test in 8 hrs. will allow the sepn. of milks under examn. to be placed in 24 groups. Its simplicity and practicability make it preferable to the other two.

H. A. LEPPER

The advantages of a carbohydrate medium in the routine bacterial examination of milk. J. M. SHERMAN. Pennsylvania Agr. Expt. Sta., *Ann. Rept.* 1915-16, 301-6. —Data are presented which it is thought warrant the recommendation that agar containing dextrose or lactose be adopted as the standard medium for the routine bac-

teriological analysis of milk. In a carbohydrate medium a higher count is obtained and the colonies grow larger and more rapidly, than in plain agar which facilitates the counting of plates, cf. *C. A.* 12, 1569.

J. J. SKINNER

An associative study of *Streptococcus lacticus* and *B. subtilis* in milk. MAX S. MARSHALL. *J. Dairy Sci.* 3, 406-13(1920).—The presence of *B. subtilis* in milk influences lactic fermentation, stimulation increasing with the concn. of the bacillus in the earlier stages of the fermentation. The "optimum" ratio of *B. subtilis* to *Strept. lacticus* which gives the greater stimulation is approx. 22 to 10,000, being more evident at low than at high temp. Association plays an undeterminable part in the difference in lactic fermentation caused by clarification.

H. A. LEPPER

Clarification of milk. CHARLES E. MARSHALL AND E. G. HOOD. *J. Dairy Sci.* 3 245-59(1920).—The clarifier by its action modifies the fermentations of milk by its influence on the germ content and the differences are made manifest by alterations visible to the naked eye due, in part, to the following changes: Growth of *Didium lactis* on the surface of the clarified milk or lactic fermentation, increase in proteolysis, slight uniform increase in acidity, increase in CO₂, and change in character of the curd. Casein deposited from unclarified milk produces mold abundantly and seemed to undergo proteolysis readily and rapidly while that from clarified milk seemed much freer of molds and proteolysis and followed the course as witnessed in cheese curd when acid had been developed. The surface of unclarified milk should reveal an abundant growth of molds while the clarified will appear quite free of mold. The causes of these differences are due to the power of the clarifier to pick out the heavier microorganisms in greater % than the lighter (selective action), associative influences resulting from disturbed germ content, the influence of the clarifier to break up colonies or groups of microorganisms distributing them throughout the milk, aeration and other unknown or undeterminable influences.

H. A. LEPPER

Reconstructed milk. ALBERT F. STEVENSON, GEORGE C. PECK AND C. P. RHYNS. *Pub. Health Repts.* 35, 2011-45(1920).—Reconstructed milk is made by emulsifying unsalted butter in a soln. of skimmed milk powder. It is used as a source of milk when an adequate supply of fresh milk is not possible. This paper is concerned with economic and hygienic studies of the product with the purpose of establishing laws for its control. The reconstructed milk produced at the plant where the studies were made showed that from its bacterial content it was satisfactory from a health standpoint. From the milk and cream satisfactory ice cream can be manufd. on a com. scale, with a bacterial content comparable to that of well pasteurized milk and cream.

JULIAN H. LEWIS

The preservation, refinement and manufacture of milk, blood and other protein carriers. E. F. RASCH. *Milchwirt. Zentr.* 49, 61-7(1920).—In the usual protein preps. from milk, blood, etc., the proteins are coagulated with or without acids and with or without application of heat. Such coagula are insol. and difficultly digestible. In the case of cheese the bulk of the lactose of milk is lost in the whey, and this is a great drawback from the standpoint of nutrition. Importance of lactates in treatment of rachitis and insomnia is emphasized. Higher nutritive power of human milk may be traced to its lower acidity when compared to cow milk. R. advocates the treatment of milk, blood, etc., with alkali (NaOH or NaHCO₃). This "alkalized" milk is more resistant to putrefaction and souring; the proteins are in a more sol. and finely divided state; in case of milk the product is not coagulated by rennin or pepsin. *Ibid* 77-8.—"Nutrose" and "Eucasein," well known com. alkali caseinates, are made from pure casein and are therefore without the value of the other substances originally present in milk. The added alkali conserves the secretion of alk. reaction in the middle alimentary canal for the sapon. of the fats and neutralization of released fatty acids.

H. F. Z.

A bacteriological and biochemical study of experimental butters. CHAS. W. BROWN, LULU M. SMITH AND G. L. A. RUEHLE. *J. Dairy Sci.* 3, 375-405(1920).—The effect of ripening and pasteurization on the keeping qualities of butter was studied together with the effect of washing the butter with lactic acid, adding casein, fishy butter, and boric acid. No striking proofs of relationship between methods of manuf. and the score or development of off-flavors were revealed. Neither pasteurization nor ripening improves the keeping quality of butters made from cream which has already soured. Relatively higher bacteriological counts were obtained on butters over a year old than usually obtained in studies of this kind. Lactic flora persisted for 275 days (one case 426 days) although gradually displaced by miscellaneous flora, predominant among which were a liquefying and non-liquefying yeast and an *Oidium* species. Gradual decrease in lactose and gradual increase in acidity were found, but they were not proportional. Butters from pasteurized cream contained $\frac{1}{2}$ as much N as those from raw cream but sol. N was about the same. Typical butter organisms (12) inoculated into milk and milk + 5% NaCl showed rapid increase in both being faster in plain milk. Increase in acid slight and about equal in each. Sol. N increased in both cases, but more in milk alone. This amt. of NaCl does not retard growth of these butter organisms as much as might seem possible.

H. A. LEPPER

Comparison of the decantation method with other methods for the determination of fat in butter. O. R. OVERMAN AND SAICHI OKIMOTO. *J. Dairy Sci.* 3, 425-9(1920).—The Kohman decantation method (*C. A.* 13, 1346) for fat in butter gives accurate results which check very close with the Mojonnier, A. O. A. C., and Roese-Gottlieb methods. Its practicability, quickness, ease of manipulation and lack of extensive app. recommend it especially in creamery control.

H. A. LEPPER

The favorable influence of selenium on some molds of the cheese industry. ANTONIN NEMEC AND VACLAV KAS. *Compt. rend.* 171, 746-8(1920).—Expts. on *Penicillium candidum*, *P. album* (Epstein), *P. roqueforti* (Thom), *P. aromaticum casei* II (Ohlesen), showed that Se in very small quantities in the presence of a modified Raulins soln. has a favorable effect on their growth. Spores of *P. roqueforti* germinated in 24 hrs. It seems that Se becomes toxic after a certain length of time in the case of *P. candidum*. The ash of this mold increases with the increase of Se in soln. up to a certain max.

H. A. LEPPER

Standardizing calculations of ice cream mix. J. A. CROSS. *Creamery and Milk Plant Monthly* 9, No. 11, 50-3(1920).—Basing his calcs. upon the principle underlying Parson's method, C. devises a somewhat shorter method of detg. the quantities of 2 different fluids of known fat content necessary to produce an intermediary product of desired fat test. It was devised particularly for use with the slide rule.

H. F. Z.

Action of hydrogen peroxide on flour. MARION. *Compt. rend.* 171, 804-6(1920).—The rate of milling of wheat (taux d'extraction) can be detd. from the amt. of O liberated by the action of the catalase in the flour from H_2O_2 . The quantity of O describes a regular curve following the quality of the flour. Method and characteristic results are given.

H. A. LEPPER

The swelling of gluten protein and its significance for the problem of the capacity for baking. H. LÜERS. Munich. *Z. Elektrochem.* 26, 420-4(1920).—A discussion of the gluten problem and the problem of the capacity for baking from the standpoint of phys. chemistry. The importance of a knowledge of the phys. chemistry of bread making is indicated.

H. JERMAIN CREIGHTON

An experimental study of the effect of certain organic and inorganic substances on the bread-making properties of flour and on the fermentation of yeast. HELEN MASTERS AND MARGERY MAUGHAN. King's College for Women. *Biochem. J.* 14, 586-602(1920).—The dough raised with yeast consisted of 200 g. flour, (containing varying amts. of wheat, barley, maize, rye and rice—"war" bread) 5 of yeast, 2

of sugar and 2 of salt and 95-120 cc. of liquid, mainly tap water, but also including any other liquid included for the expt. The addition of lime water produced little or no effect. One % fresh serum markedly increased the vol. of the loaf. Among phosphates, NaH_2PO_4 proved best. The addition of boiled potato increased the vol. by 4.2%. Malt ext. did not increase the size of the loaf. Similar expts. were carried on with doughs raised by a chemical agent (1 g. NaHCO_3 + 2 g. $\text{KHC}_2\text{H}_3\text{O}_6$). The addition of phosphates to such doughs showed no increase in the vol. of the loaf. The fermentation produced by yeast with sugar and water and in the dough was obtained on the second or third day after the yeast had been compressed. Usually the max. increase in vol. on baking was obtained when the dough was allowed to rise for 40 minutes.

BENJAMIN HARROW

Commercial production of grape sirup. W. V. CRUESS. Calif. Agr. Expt. Sta. *Bull.* 321, 401-71(1920); of, *C. A.* 13, 1349.—The diffeent manufacturing steps in the com. production of grape sirup are described in detail, and it is considered that the prepn. of this product affords one of the most promising methods of profitably utilizing the crop of wine grapes in Calif. The sirup may be kept without sterilization if it is concd. to 68° to 70° Balling. Injury to the flavor and color of the sirup by heat may be prevented by the use of a high vacuum of 28 to 29 inches during concn. and by cooling the sirup after cooking.

W. H. ROSS

The evaporation of grapes. W. V. CRUESS, A. W. CHRISTIE AND F. C. H. FLOSS-FEDER. Calif. Agr. Expt. Sta., *Bull.* 322, 421-71(1920).—This bulletin gives an account of an investigation on the construction and operation of *evaporators* for the drying of raisin, wine and cull-table grapes. It was found that dipping grapes in a dil. boiling NaOH soln. approx. doubles the rate of drying. Most wine grape varieties require an alkali soln. of 2 to 3% for effective results; other grapes require only a $\frac{1}{2}$ % soln. Grapes dried in the evaporator were improved by a short period of sulfuring before drying. Dried grapes keep perfectly when containing 25% or less of moisture, but spoil when the moisture content is over 30% unless heavily sulfured.

W. H. ROSS

Aging green coffee. CHARLES W. TRIGG. *Tea and Coffee Trade J.* 39, 440-2 (1920).—Methods of artificially maturing green coffee and renovating damaged coffee are reviewed. Bibliography. cf. *C. A.* 14, 302.

C. W. T.

Fifty-third annual report of the Dominion Laboratory. J. S. MACLAURIN. New Zealand. *Dept. of Internal Affairs* 1920, 48 pp.—Contains analyses of brown coals, lignites, oil shales, limestones, clays, diatomaceous earth, copper ores, sand, pillolite, bentonite, building stones, metalliferous samples, mineral waters, potable waters, waters for steam boilers, natural gas and kauri peats, and gives results of examn. of milk samples to ascertain the effect of treatment in a Sharples Super Clarifier on the keeping quality of milk. Clarification causes milk to sour sooner. The milk is also worse from a bacterial standpoint.

ALBERT R. MERZ

Sweet tussac (*Phalaris bulbosa* Cav.). ALEJANDRO BOTTO. Universidad Nacional de la Plata. *Rev. Facultad Agronomia y Veterinari* 12, 226-42(1916).—Analysis gave for the fodder, green, air-dried and dried at 100°, resp.: H_2O , 79.04, 11.21, —; mineral matter, 2.63, 11.14, 12.54; fat, 1.06, 4.50, 5.06; nitrogenous matter, 2.55, 10.81, 12.17; carbohydrates, 8.21, 34.79, 39.18; crude cellulose, 6.50, 27.56, 31.03.

ALBERT R. MERZ

Digestibility of sorghum mill refuse. ANDREW C. McCANDLISH. *J. Dairy Sci.* 3, 367-9(1920).—Feeding expts. on sorghum mill refuse, stalks remaining after extrn. of the juice, showed the digestibility and net energy value of its nutrients to be exceptionally low. It contains H_2O 73.12, crude protein 0.62, N-free ext. 12.98, crude fiber 11.48, crude fat 0.46, and ash 1.34%.

H. A. LEPPEL

Digestibility of corn cannery refuse. ANDREW C. McCANDLISH. *J. Dairy Sci.* 3, 370-4(1920).—Corn cannery waste consisting mainly of sweet corn husks with only small amts. of spoiled ears and cobs is shown by feeding expts. to have a feeding value equal to good corn silage when mixed with 5 bushels of corn to the ton. Proper methods of storage and handling are necessary, as it ferments rapidly. H. A. LEPPER

Comparative values of feeds. CHAS. H. BRIGGS. *Northwestern Miller* 124, 180-1(1920).—This article presents a good non-technical discussion of the factors entering into the value of mill feeds as detd. by chem. analysis. Variations in results due to different analytical methods and to differences in methods of calcg. are of economic importance both to the miller and buyer. The requirements for different states and allowances for variation are given. Nine formulas in use for calcg. values by different methods are given and explained.

L. A. RUMSEY

Principal fodders, including the small bamboo *Dendrocalamus strictus*, in the central provinces and Berar. D. CLOUSTON AND F. J. PLYMEN. *Agr. J. India* 15, 380-5(1920).—The feeding value of grasses from the central provinces and Berar, judged by their chem. analysis, is much below that of grasses produced in several other countries. Egyptian clover or berseem (*Trifolium alexandrinum*) and the small bamboo (*Dendrocalamus strictus*) show much promise for adoption on a large scale. For berseem and for bamboo leaves, resp., the following values were found: Moisture, 81.63, 66.07; ether ext., 0.51, 0.97; total N as protein, 3.22, 6.34; sol. carbohydrates, 8.26, 12.75; crude fiber, 4.00, 9.45; ash, 2.38, 4.42. The dry bamboo leaves contain nearly 4 times as much protein as do the common grasses. The proportion of indigestible fiber is greater in grasses than in bamboo leaves. The nutritive value of bamboo leaves appears to be equal to grasses while the yield per acre (20 tons) is much greater than that obtained from grasses. The seed of the bamboo is a good food grain and the culms may be used for many purposes.

F. M. SCHERTZ

Preparation and digestibility of straw prepared by Beckmann's method. H. WAGNER AND G. SCHÜLER. *Landw. Ztg. Fühlings* 68, 228-34(1919).—Two % lye was used to hydrolyze the straw which was placed in a wooden tank. The process was conducted at ordinary temp. and was completed when the nodes could be easily crushed between the fingers. The digested product, after being carefully washed free of all alkali, was fed to sheep. Straw prepared by the Beckmann process was found to be very serviceable fodder fed either wet or dried.

F. M. SCHERTZ

The individual characteristics of some edible oils (POLLIT) 27. The production of edible oils (ANON.) 27. Digestibility of germinated beans (ATKINS) 11E. Some experiments conducted with pure cultures of bread yeast (HENDERSON) 11C. Studies of the flocculating yeasts (STAIGER) 11C.

FRANCESCHI, CIAMBATTISTA: Conservazione delle postanze alimentari. 5th Ed. Revized. Milan: Ulrico Hoepli. 350 pp. L 10. For review see *Boll. chim. farm.* 59, 406(1920).

NEUMANN, R. O.: Die im Kriege 1914-1918 verwendeten und zur Verwendung empfohlenen Brote, Brotersatz- und Brotsreckungsmittel unter Zugrundelegung eigener experimenteller Untersuchungen. Berlin: Julius Springer. M. 28. For review see *Z. angew. Chem.* 33, II, 392(1920).

Testing cream for fat. H. M. HOYBERG. U. S. 1,357,168, Oct. 26. In testing undild. cream for fat, 5 vol. of the cream is mixed with 6.5 vol. of a soln. containing 50-70 g. NaOH and 70-130 g. KNa tartrate per liter and 0.46 vol. isobutyl alc. in a butyrometer glass; the mixt. is allowed to stand for 15-20 min. in a water bath at 60-70° and the quantity of fat may then be directly read from the glass.

Cheese. C. F. DOANE. Brit. 148,724, Jan. 21, 1920. In making Emmenthal or Swiss cheese, the milk is preliminarily heated to a temp. between 134 and 155° F., preferably 143° F., for approx. 30 min. and then cooled to about 88° F. Salt or HCl is then added to the milk, a suitable proportion of acid being 110 cc. of commercial acid to 1650 lb. of milk, the acid being dild. with 2 gal. of H₂O before addition to the milk. Bacterial cultures of two different organisms are then introduced, the first culture being *bulgaricus*, which is added to the batch in the proportion of two quarts of milk, in which the culture has been made, dild. with 2 gal. of H₂O; the second culture for adding to each batch is provided by adding 30 g. of ground Swiss cheese to 1500 cc. of sterilized whey and developing for 24 hrs. The temp. of the milk is raised to 95° F. and about 110 cc. of rennet ext. added to each batch. After allowing to set for 30 min., the curd is cut and stirred until the particles are about the size of kernels of corn. The curd is then heated up to approx. 130° F. and during this heating, which takes about 30 mins., and for 40 min. after the desired temp. has been attained the curd is stirred by a standard whip stirrer. The curd is then dipped with a linen cloth of open mesh and the curd is placed in a hoop and pressed to give form to the cheese. The formed curd is turned and the cloth changed four times at intervals of about 1 hr., and the pressing continued for 20 hrs. longer. The cheese is placed in a brine tank for 48 hrs. and then in a cold room at about 56-60° F. After this it is placed in a warm room, 68-72° F., until eyes are fully developed, and then returned to the cold room to develop flavor and texture. Cf. C. A. 14, 1589.

Utilizing milk residues. P. CLAES. Brit. 148,488, July 10, 1920. Milk residues, such as whey, buttermilk, or curdled milk, are concd. and utilized for food or other purposes. The material is sterilized, and the lactic acid neutralized, preferably with Ca₃(PO₄)₂, CaCO₃ and Fe₂O₃. The material is then passed through a homogenizer to break up coagulated casein, and concd. *in vacuo* at a temp. below 70° until a pasty consistency is reached. The concn. may be stopped while the material is still liquid, and the liquid filtered and lactose allowed to crystallize out. The mother liquor and the solid residue are then remixed, and the concn. completed.

Drying fruit, vegetables, etc. E. BABCOCK. Brit. 148,836, July 10, 1920. Sliced fruit, vegetables, etc., are strung upon rods and carried in a circuitous course through a drier, and are bleached and passed through liquid before entering the drier. The liquid may seal the bleaching conduit at the ends. The bleaching conduit is provided with dampers controlling inlet and exit of a sulfurous gas or other bleaching agent.

Edible oil preparations. H. V. DUNHAM. Brit. 148,734, Jan. 30, 1919. In dry powdered oil preps. of the kind produced by evapg. an aq. emulsion of the oil, a protein such as casein or egg white is used as the emulsifying agent and the emulsion is homogenized. An edible oil such as olive oil, nut oil, cottonseed oil, soy-bean oil, lard, or oleo oil, either in the original condition or after hydrogenation is emulsified by agitation with a soln. of casein in H₂O containing NaHCO₃, or with raw egg, egg white, egg yolk, or redissolved dried egg, and the emulsion is passed through a homogenizer under high pressure, dried under vacuum, and pulverized. The soln. of albuminous material used contains more albumin relative to the H₂O than does ordinary milk. Preferably a soln. containing 20-33% of casein is employed. The finished product contains 50-66% of oil. The powdered products form stable emulsions when mixed with H₂O and may be used as a *cream substitute* in coffee or like beverages or for *enriching milk*. Flavoring such as salt, phosphates, hypophosphates, lactates, citrates, malt products, sugar, and enzymes may be added in small quantities.

13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

Rail conveyance of chemical commodities. L. ARCHBUTT. *J. Soc. Chem. Ind.* 39, 371-3R(1920). E. J. C.

Theory vs. practice and trade secrets from the viewpoint of the industrial chemist. JOHN ARTHUR WILSON. *Chem. Met. Eng.* 23, 1086(1920). E. J. C.

Engineers and public service. HERBERT HOOVER. *Chem. Met. Eng.* 23, 1077-80 (1920).—An address. E. J. C.

Use of stench as a warning in mines. S. H. KATZ, V. C. ALLISON AND W. L. EGY. *Bur. Mines, Tech. Paper* 244, 1-27(1920).—Stench may be placed in the compressed air lines of a mine by means of an injector, and used to warn miners of danger; this mode of warning is characterized by reliability of action and positive effect on the miners. The stench must be non-toxic, exert a moderate vapor pressure, and have a distinctive odor, disagreeable rather than pleasant. Tests were made with the following 24 compds.: acetates (amyl, ethyl), acids (butyric, valeric), amyl alc., ether, mercaptans (butyl, isobutyl, propyl, Et), thioethers (Et, amyl), isothiocyanic esters (Me, allyl), amyl isovalerate, Me salicylate, oil of peppermint, artificial musk, pyridine, CCl_4 , CHCl_3 , CH_3 , $\text{C}_6\text{H}_5\text{NO}_2$, $\text{C}_6\text{H}_5\text{NC}$. Of these compds., those most promising for mine warnings were Et mercaptan, butyl mercaptan, amyl acetate, butyric acid, and valeric acid. Tests performed in mines showed that these compds. may be used to give a quick and positive warning. Good ventilation must be established to clear the mine of the stench after a warning. A description is also given of an *odorometer* or app. for measuring intensity of odors in the lab. examn. of stench. J. S. H.

Gases. E. ZUNZ. *Ann. bull. soc. sci. m  d. natur.* (Bruxelles) 1909, No. 3, 66; *Physiol. Abstracts* 5, 47-8(1920).—The compds. used in chem. warfare are classified as highly toxic, suffocating, lachrymatory, vesicant, and sternutative. *Highly toxic gases* such as CO and HCN kill almost immediately if they be present in the air in sufficient concn. *Suffocating gases* (e. g., Cl_2 , COCl_2 , the monochloromethyl and trichloromethyl esters of chloroformic acid) are extremely irritating and corrosive, and produce inflammation of the lungs accompanied by fatal edema, as well as asphyxia and cardiac collapse; if the intoxicated person survive, for a long time he is subject to digestive, circulatory and nervous disorders similar to those produced by lack of O_2 at high altitudes. *Lachrymatory gases* (e. g., benzyl bromide and iodide, dichlorophenylcarbylamine) put a soldier out of action by producing first irritation, then intense and prolonged watering of the eyes with slight irritation of the upper respiratory tract; recovery is complete in several days. The chief *vesicant* is mustard gas; it produces inflammatory lesions of the skin, eyes, and respiratory tract, and, at times, general intoxication; the recovery is usually rapid. *Sternutatives* may be either solids (e. g., diphenylchloroarsine, diphenylcyanoarsine) or liquids (e. g., ethyldichloroarsine), and produce violent pains in the sinuses, intense irritation of the nasal cavity, abundant secretion, prolonged paroxysms of sneezing, expectoration, and nervous disturbances; the lesions of the respiratory app. may produce death. J. S. H.

Hygienic precautions to be observed in the manufacture and industrial use of carbon disulfide. JULIUS BLAIN. *Industrie chimique* 7, 311-3(1920).—Workers handling CS_2 under unsatisfactory hygienic conditions are subject to serious intoxication resulting in neurotic disorder and greatly lessening their capacity for work. Certain types of workers are more susceptible than others; especially is this true with alcoholics and others of weakened vitality. Medical examn. of all employees at regular periods and the immediate examn. of those complaining of symptoms such as eye fatigue are recommended. Among the industrial uses for CS_2 are extg. grease and oil from bones

(to be used for bone black), from seeds and oilcakes; degreasing wool; purifying paraffin; extg. perfumes; dissolving S from its minerals; manuf. of liquid fire, certain types of varnish and rubberized cloth, and in the vulcanization of rubber by the cold (Parke) process. In all of these industries the factories should have high ceilings and adequate ventilation; periodic medical examn. is recommended wherever possible. Gt. Britain has stringent laws regulating factories making rubberized cloth. A diagram is shown of a filter for removing sulfur-carbon compds. from the air by means of crude petroleum and CaCl_2 .

S. D. KIRKPATRICK

Industrial poisoning in the manufacture of airplanes, explosives, and dyes. THOMAS M. LEGGE. *J. Ind. Hyg.* 2, 121-8(1920).—Lowell Inst. Lecture, 1919. Poisoning by $\text{C}_2\text{H}_2\text{Cl}_4$, which is used as a solvent for airplane dope, and the resulting toxic jaundice may be reduced to a minimum, and fatal results prevented by ventilation with fresh air at low velocity, changing the whole of the air in the workroom every 2 min., placing the exhaust fans at the floor level and the air inlets at a height of 8 to 10 ft.; draughts are prevented by having the air inlets at least 2 times the area of the exhaust fans. The same system of ventilation is of service in the prevention of poisoning by benzene vapors, *e. g.*, in the rubber industry. Attention is also paid to industrial poisoning by nitrous fumes, $\text{C}_6\text{H}_5\text{NH}_2$, nitro compds., and aniline dyes, and to industrial eczema (*cf. C. A.* 14, 775). Industrial poisons may enter the body as gases or fumes, liquids or solids (dusts), and may gain entrance through the gastrointestinal tract, the respiratory tract, or the skin.

JOSEPH S. HEPBURN

Purification and regeneration of used lubricating oils. EMILE SAILLARD. *Circ. hebdom. synd. fabr. sucre* Dec. 14, 1919; *Z. Ver. Zuckerind.* 70, 470.—The waste oil is mixed with 5% of H_2SO_4 of 52° Bé., and thoroughly agitated with it. Then 5% of a mixt. of equal quantities of Na tannate and gelatin, which mixt. must have an acid reaction, is stirred into the oil. The latter is siphoned off after 24 hrs., or centrifuged after 2-3 hrs.

F. W. ZERBAN

Electrical refrigeration. C. J. CARLSEN. *Elec. J.* 17, 502(1920).—Detailed account of the high-p. and the low-p. systems of making ice. The current consumption per ton of ice varies in different plants, but usually runs from 35 to 55 kw. hrs.

D. I. GLEIM

Wilmington and the chemical industry. ANON. *Chem. Met. Eng.* 23, 1083-5 (1920).—Abstracts are given of the following papers which deal with processes and products of industries located at Wilmington: "The finishing of cotton goods," by D. S. Ashbrook; "Manufacture of glazed kid leather," by F. J. Blatz; "Lithopone," by A. S. Krebs; and "Vulcanized fiber," by Jay Robinson.

E. J. C.

Report of the work of the (Egyptian) government analytical laboratory and assay office during the period 1913-9. A. LUCAS. Gov't Publications Office 1920. *J. Soc. Chem. Ind.* 39, 325-6R(1920).—An abstract. Fuel oil suitable for internal-combustion engines is obtained by distg. black residue (mazut) from the distn. of Hurghada crude oil. Distn. of the crude oil is difficult because of NaCl admixt., but the emulsion is broken by application of high-tension elec. current. A volumetric process for assaying gold by means of HgNO_3 was developed with *o*-toluidine as indicator. Corrosion of concrete by sewage is due to penetration of gaseous S compds. afterwards oxidized, and is prevented by artificial ventilation, and by applying a protective coating to concrete above the water line.

W. H. BOYNTON

Report of the government chemist upon the work of the government laboratory for the year ended Mar. 31, 1919. ANON. *J. Soc. Chem. Ind.* 39, 328-9R(1920).—An abstract of the report covering chem. work done for gov't depts. in Great Britain and Ireland indicates further revival in trade. Of so-called non-alcoholic beers, all contained EtOH (2-5% proof and one 9.6%). None, of over 1000 milk samples, gave evidence of preservatives and no foreign fat was found in imported butter. Investi-

gations include *potash production*, the examn. of road drainage for toxic constituents from *tar*, the extn. of *Ra* of luminous dials, etc., and the disposal of *waste from flux factories*.

W. H. BOYNTON

The distillation of a ternary mixture, one component of which is not volatile (PASCAL) 2.

SNOEP, P. PERSANT: *Technisch-hygiënische beschouwingen over de economie van den industrielen arbeid*. Leiden: Uitgave S. C. van Doesburgh. 194 pp. F. 3.80. For review see *Chem. Weekblad* 17, 523(1920).

Jahrbuch der Technik. Jahrgang VI (1919-20). Stuttgart: Franckh'sche Verlagsbuchhandlung. 384 pp. 12 M., bound 20 M.

Steam: Its Generation and Use. 9th British Ed. London: Babcock & Wilcox, Ltd., Oriol House. For review see *Intern. Sugar J.* 22, 520(1920).

Filtering gases. E. DANHARDT. Brit. 148,795, July 10, 1920. A filter for furnace gases, etc., is composed of metal gauze or perforated metal provided on one side, preferably that on which the gas impinges, with a layer of asbestos, slag wool, or other mineral fibers.

Filtering gases. E. DANHARDT. Brit. 148,800, July 10, 1920. In a filter for furnace gases, etc., constructed of metal gauze or perforated metal plates interwoven with mineral fibers, such as asbestos or slag wool, or having its wire threads enveloped in mineral fibers, the surface of the fibers is roughened on the side on which the gas impinges. The roughening means may be such as are used for roughening textile fabrics.

Filtering gases. E. A. R. CHENARD. Brit. 148,811, July 10, 1920. Addition to 130,992. Gases or vapors are deprived of drops of liquid accompanying them by passage through a group of metallic screens moistened with the liquid to be removed. The gas enters a chamber by a pipe and passes through a number of superimposed metal screens which are clamped together between frames and supported on brackets. The liquid retained by the screens serves to arrest further liquid and then falls to the bottom of the chamber to be removed to the vessel while the deprived gas passes out by a pipe. In certain cases, it is necessary to spray liquid onto the screens through a pipe either to start or to maintain the operation. The process is stated to be applicable to the sepn. of tar from coal gas, etc.

Liquefying gases. O. IMRAY. Brit. 148,588, Jan. 30, 1919; 106,675 (cf. C. A. 11, 2603). Heat is transferred from one portion of the fluid undergoing progressive liquefaction to another by exchange of heat between portions of fluid at temps. differing very little, the transfer of heat being effected in what is termed a substantially "reversible" manner. A suitable construction is specified.

Atomizing fusible materials. METALLATOM GES. Brit. 148,776, July 10, 1920. In app. for spraying fusible material such as glass, enamel, or metal, of the kind in which the material is progressively fused and then sprayed by means of gas pressure, the material to be sprayed is in the form of a ribbon which is unrolled from a drum and fed through an opening. A suitable app. is specified.

Refrigerating. H. W. SEAMAN. Brit. 148,874, July 10, 1920. A refrigerant for use in a compression refrigerating system consists of one of the hydrocarbons of the methane series that comprises more than two and less than five atoms of C, particularly propane and butane. The specification contains a table comparing the physical properties of several of the hydrocarbons of this series.

Refrigerating. H. W. SEAMAN. Brit. 148,875, July 10, 1920. A refrigerant for use in a compression refrigerating system consists of a mixt. of hydrocarbons of the paraffin and olefin series, preferably those comprising more than two and less than

five atoms of C, namely propane and propylene, propane and butylene, butane and propylene, or butane and butylene. Other members of these series may be used with one or more of the above mentioned hydrocarbons. The specification contains a table comparing the physical properties of these two series of hydrocarbons.

Refrigerating. H. W. SEAMAN. Brit. 148,877, July 10, 1920. A refrigerant for use in a compression refrigerating system consists of one of the hydrocarbons of the olefin series comprizing more than two and less than five atoms of C, particularly propylene and butylene. The specification contains a table comparing the physical properties of these hydrocarbons with C_2H_4 and amylene.

Refrigerating. H. W. SEAMAN. Brit. 148,878, July 10, 1920. A refrigerant for use in a compression refrigerating system consists of a mixt. of hydrocarbons of the same series, such as propane and butane, in proportion ranging from 60-15% propane and 40-85% butane. Other hydrocarbons may be used in addition to or in place of either or both of the above mentioned hydrocarbons, for instance a mixt. of propylene and butylene with or without C_2H_4 , or amylene or a mixt. of ethane or pentane with propane or butane but preferably the hydrocarbon should have more than two and less than five atoms of C.

Refrigerating mixture. A. HENNING. U. S. 1,356,765, Oct. 26. A mixt. of $EtCl$ 96 and $MeCl$ 4 parts is used in refrigerating machines.

Molded articles of asbestos and shellac. J. F. CAVANAGH. U. S. 1,357,147, Oct. 26. Molded articles adapted for use as *elec. insulators* are formed by mixing asbestos and shellac in the proportions of 4:3, resp., baking the mixt. until firm, then crushing it to a fine powder and molding the powder under heat and pressure.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Relationship of hydrogen-ion concentration of natural waters to carbon dioxide content—correction. R. EDMUND GREENFIELD. *J. Ind. Eng. Chem.* 12, 1214(1920); cf. *C. A.* 15, 134. E. J. C.

The calculation and determination of the amount of active carbonic acid in drinking water. I. M. KOLTHOFF. *Chem. Weekblad* 17, 390-6.—The amount of active carbonic acid in water is calcd. from the formula $[CO_2] = \alpha^2 [HCO_3]_t^{1/2} [Ca^{++}] / (1.13 \times 10^{-4})$, in which α represents the degree of dissociation of $Ca(HCO_3)_2$. From this formula a table was calcd. for different concns. of HCO_3^- and Ca^{++} . The values agree with those found by expts. The tables of Tellman and Heublein can only be used if $[HCO_3^-] = [Ca^{++}]$. J. B. KRAK

Preparing Pittsburgh district waters for boilers. ANON. *Power Plant Eng.* 24, 777-16(1920).—A description of intermittent water-softening systems using Monongahela river water in the plants of A. M. Byers Co. and W. J. Rainey. The quality of the water fluctuates greatly and at times the water carries 50 pts. per mil. SO_4 . The Byers plant consists of two 80,000 gal. tanks for alternate treatment and use. It is rated at 20,000 gals. per hr. Water is agitated mechanically. Quartz filters are used to complete clarification. Before treatment, boilers were heavily incrustated with hard scale. Treatment was gradually increased until heating surfaces were free from scale. Tube replacements have been materially reduced and shut-downs due to bad water eliminated. The Rainey plant is of smaller size but is similar in construction.

R. C. B.

A new plan for water service administration. ANON. *Railway Age* 69, 111-3.—An outline of the water service organization on the Union Pacific Railroad. R. C. B.

Water softening in small plants. ANON. *Power Plant Eng.* 24, 351-6(1920).—The water used varies in hardness from 180 to 4 grains per gal. Treated water gives

no scale trouble but causes serious pitting and it also foams. Surface blow-off and skimmers were used unsuccessfully. Raw water gives no pitting trouble but bad scale conditions. The chemical mixing vat has been used 8 yrs. and is still in good shape but the shell of the softener is pitted.

R. C. B.

Securing uncontaminated water in coal territory. ANON. *Railway Age* 69, 152-4(1920).—Railroads traversing coal fields encounter difficult problems in boiler feed water. It is suggested that the liability of pollution from coal stratum be detd. by contours on coal seam elevations and outcrops. Watershed should then be selected which holds the least possibility of contamination with the usual procedure in the detn. of reservoir site and dam.

R. C. B.

Corrosion of concrete by sewage (LUCAS) 13. **Analysis of oil-field water problems** (AMBROSE) 22. **Economics of refuse destruction** (GREMPF) 20.

Water-softening material from glauconite. J. E. CAPS. U. S. 1,356,756, Oct. 26. Greensand or glauconite is prepd. for use as a H_2O -purifying or softening agent, by heating the material while exposed to air to effect oxidation and dislodgment of free Fe from the surface and removing the oxidized material.

Preventing incrustation. O. RUMMEL. Brit. 148,778, July 10, 1920. Incrustation of boilers, feed heaters, etc., is prevented by adding to the H_2O finely divided graphite or C or finely divided metals such as Zn or Al and connecting the walls of the boiler, etc., to the negative pole of a source of electricity, an electrode connected to the positive pole being immersed in the H_2O . The finely divided substance may be obtained by means of a high-pressure steam jet or by forming an arc between electrodes of the substance immersed in H_2O whereby a colloidal soln. of the substance is obtained.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Capillary movement of soil moisture. ANON. *Eng. and Contr.* 54, 540-1(1920).—An abstract of *Bull.* 835 issued recently by the U. S. Dept. of Agr. J. A. M.

Soil acidity and a field method for its measurement. EDGAR T. WHERRY. *Ecology* 1, 160-73(1920).—See C. A. 14, 1866. T. G. PHILLIPS

Water and silt studies of different rivers of Java. L. G. DEN BERGER AND F. W. WEBER. Dept. Landb., Nijv. on Handel (Dutch East Indies), Meded. *Alg. Proefstu. Landb.* No. 1, 1919, 39 pp; *Expt. Sta. Rec.* 42, 421-2(1920).—This is a report of the studies of the quantity of silt in river waters, its physical and chem. properties and their influence upon the soil, and a study of the compn. of the river waters and of the influence of the sol. constituents on the soil. The influence of flooding depends upon the compn. of the flood H_2O and of its silt, and the compn. of the soil. A balance occurs between flood H_2O and soil, detd. by the amt. of dissolved matter in the H_2O and sol. matter fixed by the soil. A method is described whereby the influence of flooding a soil with H_2O of known compn. can be detd. The amt. of dissolved matter varied greatly. Silicates were high in waters from volcanic regions, while CaO , Na_2SO_4 , $CaSO_4$ and $Ca(HCO_3)_2$ were high in waters from marl or lime soils. Iron oxide, Al, and phosphate are present in some waters which when acid contain more Fe and Al. K was not found in any large amts. Absence of injurious constituents such as free mineral acids or chlorides was noted. It was found that no relation existed between grain size and silt content of the H_2O . The coarser silts were, generally, from waters whose silt content were higher, though silt from H_2O nearest the bottom did not always contain the most sand. Volcanic silt consisted mostly of dust, while marl silt contained large dust and clay fractions. Silts from the lime soils contained the greatest dust.

fraction. The greatest difference in chem. compn. of silts was found in rivers which flow through volcanic and marl soils. Greater variations were found in silt samples from the water surface than from near the bottom. Normal amts. of N, P_2O_5 and K in available form were present in all silts which were analyzed, while they were found to be rich in CaO and Mg. It is concluded "that no danger or difficulty attends the deposition of this silt on arable soil from the chem. standpoint, with perhaps the exception that the excess lime content might effect the soly. of the P_2O_5 content of the soil. From the physical standpoint it is pointed out that the fine silt should benefit coarse sandy soils, and coarse sandy silt should benefit heavy clay soils. The daily silt detns. showed that a high silt content corresponded with high water." R. B. D.

The exhaustion of Indian soils and the methods by which this may be remedied. R. V. NORRIS. *Agr. J. India* 15, 423-43(1920).—The soils of India are rapidly being depleted and the supply of indigenous manurial products is being exported so that the price is prohibitive to the small cultivator. Measures to prevent this deficiency are discussed and attention is directed to the utilization of manurial substances.

F. M. SCHERTZ
Cultivation of the yerba maté (*Ilex paraguayensis* St. Hib.). V. Soils fitted for the yerba maté. CARLOS D. GIROLA. Universidad Nacional de La Plata. *Rev. facultad agronomia veterinaria* 12, 196-225(1916).—The ash of the yerba maté constitutes 5 to 7% of the plant and analyzes SiO_2 , 17.22%; SO_3 , 5.00%; Cl, 3.95%; P_2O_5 , 5.00%; MgO, 12.94%; Fe_2O_3 , 2.31%; Al_2O_3 , 2.16%; Mn_2O_4 , 4.77%; CaO, 14.77%; K_2O , 11.52%; Na_2O , 3.46%; C, 0.32% and CO_2 , 16.33%. Numerous complete chem. and phys. analyses of soils on which the yerba maté grows are given.

ALBERT R. MERZ
Soil studies. I. The influence of fertilizers upon the productiveness of several types of soil. II. The influence of fertilizers and plant growth upon soil solubles. W. H. JORDAN. New York Agr. Exp. Sta., *Bull.* 473, 27 pp.(1920).—Part I represents the results of fertilizer studies on several soil types made in boxes in the greenhouse. In Part II it is shown that applications of sol. compds. of N, P and K materially increased the proportion of water-sol. material, this increase being least with P and largest with N and that plant growth caused a marked diminution of these water-sol. elements.

J. J. SKINNER
Investigation of Rhenania phosphate. P. LEDERLE. *Chem. Ztg.* 44, 738(1920).—The value of this phosphatic material is mainly detd. by its P_2O_5 sol. in 2% citric acid. Lorenz's method of detn. is best. Too high results are obtained by L.'s modification of Popp's method (*Chem. Ztg.* 41, 87(1917)). Analyses of 5 commercial samples gave 40.70 to 46.00% CaO; 0.94 to 1.06% MgO; 2.34 to 2.87% K_2O ; 2.24 to 4.47% Na_2O ; 12.24 to 15.51% Fe_2O_3 and Al_2O_3 (chiefly Al_2O_3); 10.49 to 12.41% P_2O_5 ; 5.45 to 11.08% citrate-sol. P_2O_5 ; 46.60-94.70% of total P_2O_5 citrate-sol.; 19.02-23.48% SiO_2 ; 0.96-1.72% SO_3 ; 0.40-1.64% insol. matter; 0.08-0.27% H_2O .

ALBERT R. MERZ
The solubility of mono- and diammonium phosphate. G. H. BUCHANAN AND G. B. WINNER. *J. Ind. Eng. Chem.* 12, 448-51(1920).—Soly. detns. of these 2 salts made under conditions obtaining in a technical lab. permit of the derivation of the following equations, representing the g. of salt dissolved in 100 g. of the satd. soln. between the temp. limits given: Soly. of $(NH_4)_2HPO_4$ at 5° to 90° = $18.0 + 0.455t$; soly. of $(NH_4)_2HPO_4$ at 10° to 70° = $36.5 + 0.213t$.

R. B. DEEMER
Dicyanodiamide: A rapid, direct method for its determination in cyanamide and mixed fertilizers. ROLLA N. HARGER. Dept. Agr., Wash., D. C. *J. Ind. Eng. Chem.* 12, 1107-11(1920).—The method depends upon the fact that when a soln. of silver picrate is added to a soln. of dicyanodiamide the latter is quantitatively pptd. as a new double compd., $C_4H_2(NO_2)_2OAg.C_4H_2N_4$, named *silver picrate-monocyanoguanidine*, small, bright yellow platelets, softening 235° (decompn.), somewhat sol. in hot H_2O . By using excess of dicyanodiamide *silver picrate-dicyanoguanidine*, C_6H_4

$(\text{NO}_3)_2\text{OAg}_2\text{C}_2\text{H}_3\text{N}_4$ was obtained, silky dark yellow needles from H_2O . When applying the method to the analysis of mixed fertilizers add 50 cc. of water to 20 g. of the sample and stir. Next add 100 cc. of a satd. $\text{Ba}(\text{NO}_3)_2$ soln. and then $\text{Ba}(\text{OH})_2$ until the mixt. reacts alk. to litmus. Make up to 500 cc. and take a 200-cc. portion for analysis. Make slightly acid to litmus, add 30 cc. of a 5% AgNO_3 soln. and 200 cc. of a satd. picric acid soln. Stir for a few min., let stand in ice water for 30 min. and filter through a Gooch filter. Wash first with water satd. with the material pptd. and then with ether, dry at 100° and weigh. To correct for the solubility of the ppt. 0.0044 g. should be added for each 100 cc. of the soln. Cottonseed meal if present interferes with the analysis by giving a gelatinous ppt. with the picric acid. This can be avoided by adding 30 cc. of a 10% $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ soln. immediately after the addition of the $\text{Ba}(\text{OH})_2$. When chlorides are present it is necessary to filter again after the addition of the AgNO_3 .

W. H. ROSS

The changes taking place in cyanamide when mixed with fertilizer materials. ROLLA N. HARGER. Dept. Agr., Wash., D. C. *J. Ind. Eng. Chem.* 12, 1111-6(1920).—When cyanamide is mixed with fertilizer materials containing acid phosphate and 5 to 10% of moisture, the cyanamide content decreases with great rapidity. This change is represented partially by, and in the higher concns. principally by, the formation of dicyanodiamide. A given quantity of moist acid phosphate is able to transform a limited amount of calcium cyanamide. When the acid phosphate is dry the cyanamide is not affected. Moisture alone is able to cause the conversion of cyanamide to dicyanodiamide, but the change is much slower than when acid phosphate is present.

W. H. ROSS

Ammonium sulfate-nitrate, a new German nitrogenous fertilizer. ANON. *Deut. Zuckerind.* 45, 432-3(1920).—This fertilizer is not a mixt. of $(\text{NH}_4)_2\text{SO}_4$ and NH_4NO_3 , but a new chem. compd., containing 8% N as NO_3 and 19% as NH_4 . The former is quickly, the latter more slowly available. The new fertilizer saves freight charges, warehouse space and handling costs.

F. W. ZERRAN

Velocity of nitrification of salts of the general fertilizer series. G. C. GIVENS AND G. J. KUELMANN. Pennsylvania Agr. Expt. Sta., *Ann. Rept.* 1915-16, 445-51. —In the soil from the fertilizer plots, which have been in operation since 1882, it was found that nitrification goes on more rapidly and to a greater extent in a soil well supplied with lime, but is only somewhat retarded in an acid soil, and that nitrification is benefited by soil org. matter. There is little correlation between nitrification and the yield of the rotation crops here used, hay, corn, oats, wheat, except perhaps in the case of the corn crop.

J. J. SKINNER

The influence of nitrates on the growth of *Azotobacter*. T. L. HILLS. Pennsylvania Agr. Expt. Sta., *Ann. Rept.* 1915-16, 311-7. —Soil and liquid cultures containing small amts. of K, Na and CaNO_3 cause an increase in the number of *Azotobacter* in pure culture over control cultures containing no nitrate. An increasing concn. of NO_3 continues favorable to *Azotobacter* growth, up to a certain limit, but higher concns. retard the growth. A nitrate concn. limit is reached at which *Azotobacter* growth ceases. The results are discussed in relation to the "niter spot" theories advanced by the western U. S. Expt. Stas.

J. J. SKINNER

The effect of alkali on citrus trees. W. P. KELLEY AND E. E. THOMAS. Calif. Agr. Expt. Sta., *Bull.* 318, 305-37(1920).—Analyses are given of a number of soil samples which show that the sol. salt content of the soil is greatly increased as a result of irrigating with saline water. NaCl is much more toxic to citrus trees than Na_2SO_4 or NaHCO_3 . Continued application of NaNO_3 may bring about such an increase in the amount of alk. in the soil as to lead to injurious effects. The symptoms caused by alk. injury are described. It is concluded that excessive alkalinity is not the cause of the injury either in the case of saline irrigation waters or when NaNO_3 has been applied

as a fertilizer, but rather that the excessive concn. of Na as such together with the relationships it bears to the concn. of other constituents is probably more fundamentally responsible for the injury.

W. H. ROSS
Sources of agricultural liming materials. R. C. COLLISON. New York Agr. Expt. Sta., *Bull.* 478, 13 pp.(1920).—Producers of liming materials in New York State by counties are given.
J. J. SKINNER

A progress report of fertilizer experiments with fruits. R. C. COLLISON. New York Agr. Expt. Sta., *Bull.* 477, 51 pp.(1920).—Expts. on the fertilization of fruit trees, including apple, pear, cherry and grapes are reprinted. N increased yield of cherries, more than did P and K. Manure and P increased growth of young McIntosh and Baldwin apple trees. NaNO_3 had no effect. With other fruits the results were not conclusive.
J. J. SKINNER

Studies in biochemical decomposition of cow dung and urine in soils. N. V. JOSHI. *Agr. J. India* 15, 398-409(1920).—Expts. with cow dung, sheep fold manure and urine confirm the opinion expressed in a previous paper that non-nitrogenous materials like cellulose lower the amts. of nitrates formed from the org. manures in which they are present in fairly large proportion. Urine gives the greatest amt. of nitrates, whether fresh or fermented under aerobic or anaerobic conditions. Fresh cow dung does not nitrify but improves by storage and becomes nitrifiable after storage under both aerobic and anaerobic conditions. Results from sheep dung indicate that a mixture of dung and urine in the manure pit is not desirable from the point of view of nitrate formation and also because of the greater possibility of N losses from such a mixt. under partly anaerobic conditions. Nitrification and CO_2 production do not seem to be necessarily correlated.
F. M. SCHERTZ

Some results with nicotine and nicotine combinations in experiments on the control of *Laspeyresia molesta* Busck. LOUIS A. STEARNS. *Crop Pest Comm.*, Va. *J. Econ. Entomology* 13, 364-8(1920).—Nicotine sulfate (40%) at a diln. of 0.125% by vol. used alone as an ovicide or in combination with an arsenical resulted in a 75% control of the Oriental peach moth. These results were obtained in lab. expts. and orchards tests on a small scale. They are being extended. CHAS. H. RICHARDSON

The non-toxicity of copper for fungi in general and for mildew in particular. G. VILLEDIEU AND MME. G. VILLEDIEU. *Compt. rend.* 171, 735-9(1920).—It was previously shown (cf. *C. A.* 14, 3746) that the hypothesis that hydrated Cu oxide, deposited upon plants in anticryptogamic sprays, dissolves in minute traces in rain and dew and destroys the zoospores of mildew, liberated from their gonidia, is not tenable. Most ordinary fungi grow in media containing 1, 2, 5 and even 10% cuprammonium citrate (a very sol. salt containing 15% Cu) and *Penicillium* grows well on a sweetened nutritive agar-agar, satd. with the salt. That Cu is not the toxic element of CuSO_4 , nor of $\text{Cu}(\text{OH})_2$ is shown by the following results: (1) *Penicillium* does not grow on a sweetened nutritive agar-agar containing 0.1 g. $\text{Ca}_3(\text{PO}_4)_2$ to which 2-3% CuSO_4 or $\text{Cu}(\text{OH})_2$ is added; (2) a normal development of growth is obtained on the agar-agar to which CuSO_4 , dissolved in Ca or Mg citrate, is added; (3) growth takes place on the agar-agar containing $\text{Cu}(\text{OH})_2$ when the medium is acidulated with tartaric or citric acid; (4) the original agar-agar to which 1% H_2SO_4 (corresponding to the free acid of the CuSO_4) is added no more permits growth than does agar-agar containing an excess of CaO, MgO, BaO, CdO or soda. Whence the conclusion is reached that the toxic action of CuSO_4 is due to its free H_2SO_4 and of $\text{Cu}(\text{OH})_2$ to its basic character.
ALBERT R. MERZ

SACHSE-HABERNOLL: *Kurzgefasster Leitfaden der landwirtschaftlichen Chemie.* 6th Ed. Bautzen: Verlag Hübner. M. 8.

Fertilizers. R. BENGOUH. Brit. 148,560, July 10, 1920. Addition to 146,351. Vegetable and animal substances used as food for microorganisms in the fermentation process described in the principal patent are themselves rendered assimilable when used as fertilizer, by fermentation. The substances may be first treated with steam, acids, or alkalis. Mineral fertilizing materials, which may have been treated as described in the principal patent, may be added before, during, or after the fermentation process. The fermentation may be promoted by heating. For use, the material may be dried or mixed with absorbents. A natural or artificial culture of microorganisms may be added, and in this case the mixt. may be subjected to a supplementary dry fermentation. A fertilizer prepd. from straw is described as an example. The straw, first treated with acid and cut into small pieces, is made into a thick paste with H_2O , neutralized, and caused to ferment by the addition of organisms capable of fermenting cellulose. The fermentation is maintained and promoted by the addition of kieserite and bog iron ore. Ash, peat powder and fine soil are added to make the product easily distributable.

Improving sandy soil for agricultural purposes. H. STOLTZENBERG. Ger. 319,634, May 13, 1919. The surface is roughened with the aid of $(NH_4)_2F_2$, which is strewn upon and harrowed into the soil during the dry season. After a suitable period, the encrusted surface is again harrowed, and this treatment is repeated until the particles of sand have assumed the desired appearance. The last trace of F is then removed by sprinkling, chemical treatment, or simple exposure.

16—THE FERMENTATION INDUSTRIES

H. S. PAINE

Molasses fermentations. A. D. LITTLE, Inc. *Sugar* 22, 633(1920).—Bibliography (see C. A. 14, 3166(1920)). C. H. CHRISTMAN

Alcohol distillation from molasses. GEORGE M. APPELL. *Sugar* 22, 631-3(1920).—This article outlines the points which must be considered in establishing a plant for the production of alcohol from molasses. The equipment necessary, the raw materials and the process of manuf. are discussed in a general manner. C. H. CHRISTMAN

The use of corn in potato and rye distilleries. FOTII. *Z. Spiritusind.* 43, 322 (1920); cf. C. A. 15, 143.—A review of the accepted technic of prepn. of grain and yeast and of the fermentation of corn mashcs. W. B. VAN ARSDEL

Recent contributions to the theory of alcoholic fermentation. C. NEUBERG. *Deut. Zuckerind.* 45, 492-3(1920).—Summary of previous articles by N. and his collaborators. F. W. ZERBAN

The course of the alcoholic fermentation of yeast. E. KÖHLER. *Biochem. Z.* 108, 235-43(1920); cf. C. A. 14, 3258.—Measurements of the CO_2 production of yeast during fermentation demonstrate that the course is irregular and dependent on the concn. of sugar; and that under the influence of increasing alc. concns. the course tends to be rhythmical as was found to be true for the growth process. F. S. HAMMETT

Effect of pyruvates, aldehydes and methylene blue on the fermentation of glucose by yeast juice and zymin in presence of phosphate. ARTHUR HARDEN and F. R. HENLEY. *Lister Inst. Biochem. J.* 14, 642-53(1920).—When aldehyde is added to fermenting mixts. of yeast juice or zymin (acetone yeast) with glucose no marked acceleration in the normal rate of fermentation occurs. If a suitable amt. of phosphate be then added, the effect of the presence of aldehyde is greatly to diminish the time required for the attainment of the max. Pyruvates behave similarly. Methylene blue can be substituted for the aldehyde. The easily reducible aldehydes or methylene blue act as hydrogen acceptors. BENJAMIN HARROW

Possible new sources of power alcohol. C. SIMMONDS. *Nature* 106, 244-5 (1920).—A review. W. H. ROSS

The influence of temperature on the determination of the acid energy of wines. A. QUARTAROLI. *Staz. sper. agrar. ital.* 51, 192-8(1918).—A reply to Borntraeger (C. A. 13, 1514). A. R. MERZ

Production of grape sirup (CRUICK) 12. The sugar and alcohol industries in the devastated regions (PELLET) 28. Bacteriology and its practical applications (THAYSEN) 11C. Ammonia and the amines obtained by the dry distillation of vinasse (LAJBL) 18. Studies of the flocculating yeasts (STAIGER) 11C.

LINDNER, PAUL: Beiträge zur Naturgeschichte der alkoholischen Gärung. Berlin: Francken & Lang. M. 3.

Maturing and purifying beverages, etc. A. JARRAUD AND J. ROUSSSEL. Brit. 148,829, July 10, 1920. Beverages, such as wines, spirits, cider, etc., and vinegar are fined and improved by addition of an extract prepd. from oak wood, such as is used in making the usual storage vats. The wood, which may be the waste obtained in making casks or may be the heart of the larger branches of the trees, is disintegrated and submitted to two successive extns. with aq. alc., and a final extn. with H_2O . The alc. exts. are distd. *in vacuo* at a low temp., the residue is added to the aq. extract and the mixt. is evapd. *in vacuo* to obtain the extract in the form of a dry solid.

Yeast. FLEISCHMANN Co. Brit. 148,373, July 9, 1920. Yeast is produced by fermentation of saccharine solns., such as beet or cane molasses, in the présence of a P compd. such as H_2PO_4 or H_3PO_4 , Na, K or NH_4 phosphate, or acid phosphates of alk. earth metals such as Ca or Mg. The liquid is aerated during fermentation and is kept in a neutral condition by the addition of NH_3 or of an alkali hydroxide or carbonate.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

A simple method to recognize fraudulent substitutions of neosalvarsan. A. RORDEL. Univ. Göttingen. *Deut. med. Wochschr.* 46, 999-1000(1920).—To 1-2 cc. of a 1:10 soln. of neosalvarsan or old salvarsan (in acid soln.) a few drops of perhydrol or 1 cc. of 3% H_2O_2 are added. A whitish ppt. is formed which redissolves with a deep brownish red color. The mixt. gets warm and if enough substance is used a garlicky odor is noted. With a diln. of 1:1000 the whitish ppt. does not occur, but some opalescence. The color becomes lighter with increasing dilns. and more yellowish brown.

S. AMBERG

The pharmacological standardization of digitalis preparations. G. JOACHIMOGLU. Univ. Berlin. *Deut. med. Wochschr.* 46, 935-7(1920).—The best method to obtain the largest yield from digitalis leaves is extn. with abs. alc. in a Soxhlet. The U. S. P. percolation method is nearly as efficient. The ext. is tested on frogs, the lethal dose being detd.

S. AMBERG

Metrotonin, an ergot substitute of intense activity, administered by injection. H. BORUTTAU. *Deut. med. Wochschr.* 46, 969(1920).—Metrotonin contains acetylcholine, epinephrine and some other substances. More detailed data are to be given later. It is a substitute for ergotin.

S. AMBERG

The effects of cold and freezing upon magnesia magma and other pharmaceutical preparations. GEORGE E. EWE. *Am. Drug.* 68, No. 11, 25-6(1920).—When magnesia magma is frozen and thawed again, the stable milk-like appearance is altered and a clear, colorless liquid, with a thick white sediment results. This is due to the conver-

sion of the normal water content of the magnesium hydroxide gel into ice crystals with the result that the gel condition is disturbed and the mols. of magnesium hydroxide unite to form a fine crystalloid powder. This form is practically irreversible. The following preps. also suffer changes from cold and freezing: magma of bismuth subcarbonate, elixirs containing terpinol hydrate, Fowler's soln., compd. soln. of sodium phosphate, compd. soln. of hypophosphites, soln. of HI, soln. of FeI_2 and solns. of H_2O_2 .

A. G. DuMaz

Morphine assay of opium. AXEL, JERMSTAD. *Rept. Pharm.* 32, 257-62(1920).

—Author's abstract of a monograph dealing with a critical study of the methods employed for detg. the morphine content of opium. The methods studied are grouped in 6 classes: (1) Methods in which alcohol is employed for extg. the alkaloid; (2) methods in which water is the solvent employed; (3) lime methods; (4) methods involving pptn. and reduction; (5) polarimetric methods; (6) all other methods. J. gives a summary of his results and recommends the following modification of Helfenberg's method as being the most suitable for the texts of the national pharmacopeias: Triturate 6 g. of opium with 6 g. of H_2O until a uniform paste results. Transfer this paste by means of a small quantity of water to a tared flask, make up the total wt. to 54 g., allow to stand for $\frac{1}{2}$ hr., shaking frequently, and filter through a dry filter, 10 cm. in diam. Mix 40 g. of the filtrate with 2.9 g. of $N\text{NH}_4\text{OH}$ (17 g. NH_3 to 83 g. H_2O) and filter immediately through a dry filter 10 cm. in diam. Mix 36 g. of this filtrate with 7 g. of ether in a flask, add gradually 4 g. of $N\text{NH}_4\text{OH}$, stopper the flask, agitate vigorously during 10 min., add 10 cc. of ether and let stand for $\frac{1}{2}$ hr. Decant as completely as possible the ethereal layer on an 8-cm. filter and then pour on the remaining contents of the flask. Wash the flask and filter with 3 successive 5-cc. portions of H_2O satd. with ether. After allowing the flask to drain, dry both flask and filter at 100° . Transfer the main portion of the contents of the filter to the flask, add 25 cc. of 0.1 $N\text{HCl}$, rotate until the crystals are dissolved, and then filter the acid liquid through the same filter, collecting the filtrate in a 200-cc. flask. Finally wash the flask and filter with 75 cc. of H_2O . Add 5 drops of methyl red indicator to the filtrate and titrate with 0.1 $N\text{NaOH}$. This should not require more than 11 cc. nor less than 8 cc. of alkali, corresponding to 10 to 12% of anhydrous morphine. Pour that part of the aq. ext. which was not used in the assay into a small tared evapg. dish, weigh, evap. to the consistence of a dry ext. and weigh again. The content of water-sol. constituents is then computed by the following formula, in which x represents the percentage of water-sol. constituents, p the wt. of aq. ext. and m the wt. of the dried ext.: $x = 800m/(p - m)$. The advantages of this method are: (1) The use of opium and reagents in quantities just sufficient for the assay; (2) reduction of weighing and the concomitant measurement of vol. to one operation; (3) elimination of the use of EtOAc , the instability of which vitiates the results; (4) the use of an indicator (methyl red) which gives accurate and rapid results; (5) economy in the use of ether, which is quite an item when iodeosin is the indicator used in the titration; (6) avoidance of inaccurate results due to the alkalinity of the water; (7) possibility of combining the morphine assay with the detn. of the water-sol. constituents. Cf. *C. A.* 14, 3123.

A. G. DuMaz

Distinguishing between alkaloidal hydrobromides and hydrochlorides. H. V. ARNY AND HUGO H. SCHAEFER. *Am. Drug.* 68, No. 11, 26(1920).—The HBr radical may be distinguished from the HCl radical in quinine salts as follows: Dissolve 0.1 g. of the salt in 10 cc. of H_2O and add 1 cc. of $N\text{NaOH}$. Filter off the pptd. alkaloid and add to the filtrate 1 cc. $N\text{H}_2\text{SO}_4$. Now add 5 cc. of 0.1 $N\text{AgNO}_3$ and, when the ppt. of the resulting Ag halide has formed, add 6 cc. of exactly 10% NH_3 soln. and shake. A resulting clear soln. indicates hydrochloride, while an insol. ppt. indicates hydrobromide. It is essential that the quantities and strengths of the reagents be strictly adhered to. The test may be employed with other alkaloids provided the quantities

employed be so adjusted that the equiv. amts. of HCl or HBr will be present in the soln.

A. G. DUMRZ

German medicinal agents. AUGUSTE LUMIÈRE. *Chimie et industrie* 4, 435-42 (1920).—A large proportion of the new remedies are of German origin. The reasons for this are said to be the attitude of French scientists to the atomic theory, unfavorable economic conditions, unfavorable official as well as general attitude toward new products and their originators; and more important than all others, the insistence by French scientists that every product be thoroughly tested and its value established before exploiting it—a condition which does not deter the German experimenter. A short time before the war an Institute of Research was created to foster such expts. In spite of the interruption, work is continued and much is being accomplished but under difficulties. Plans of the buildings and grounds with illustrations of the labs. and descriptions of work accomplished follow. Among these are discoveries in physical chemistry and therapeutics along with a respectable list of new chemicals and medicinal agents of proved value. Important progress is also noted in microbiology, such as enterovaccination, chemotherapy in tuberculosis, action of antiseptics, improved treatment of wounds and a long list of studies in progress. The value of the German medicaments is questioned as well as their originality. The author hopes for certain changes in attitude not only to encourage development of new agents but to obtain endorsement by French physicians. In this way the German monopoly maintained so many years will be broken.

H. C. HAMILTON

Solubility of mercuric peptonate. P. DELSART. *Bull. sci. pharmacol.* 27, 525-8 (1920).—The soln. of the Hg peptonate of the French Codex is hard to accomplish. In its prepn. there is always formed a ppt. which contains Hg; this ppt. is more or less abundant, depending upon the acidity of the mixt. and the degree of peptonization, conditions the limits of which are rarely exact. Moreover, the prepn. is unstable in either dark or light, forming insol. HgCl. If Hg remains in soln. the greater part, perhaps all of it, is as HgCl₂, or more exactly NaHgCl₂ in equil. with its constituents. It seems, however, that the presence of peptone modifies this equil., since ether does not ext. the same amts. of HgCl₂, according to the presence or absence of peptone, and since alkalis do not give a ppt.

F. S. HAMMETT

Organic arsenic derivatives. H. FOURNEAU. *Bull. sci. pharmacol.* 27, 529-43 (1920).—A review.

F. S. HAMMETT

Alkaloids of the pomegranate. G. TANRET. *Bull. sci. pharmacol.* 27, 486-93 (1920).—A review.

F. S. HAMMETT

Brief notes on materia medica, pharmaceutical chemistry and galenic pharmacy. I. Materia medica. JOSÉ R. SERRÉS. Universidad Nacional de La Plata. *Rev. facultad agronomía y veterinaria* 12, 249-78(1916).—A materia medica of sugar- and polysaccharide-containing substances and of fatty acid and aromatic substances. A. R. M.

Standardization of thyroid preparations. C. O. JENSEN. *Hospitalstidende* 63, 505(1920); *J. Am. Med. Assoc.* 75, 1104.—J. uses the axolotl or larva of *Ambystoma mexicanum*, which is increasingly employed in lab. research. It does not undergo the metamorphosis usual in such amphibians, but persists and breeds in the larval stage, without the transformation process which changes it—like the tadpole—from a water to a land animal. J. has found that treating the axolotl with thyroid prepn. is promptly followed by the natural metamorphosis. This occurs so invariably that it may be utilized for the standardization of thyroid prepn. The phenomenon is attributed to an inherited substandard condition of the animal's own thyroid gland, reducing its functional capacity below the level required for the physiologic metamorphosis. The effect of the thyroid prepn. did not parallel their I content.

L. W. RIGGS

Three lecture experiments (testing for morphine) (PEREIRA) 2.

Medicinal oil preparations. H. V. DUNHAM. Brit. 148,587, Jan. 30, 1919. In dry powdered medicinal oil preps. of the kind produced by evapg. an aq. emulsion of the oil, a protein such as casein or egg white is used as the emulsifying agent and in homogenization of the emulsion as a step in the process. A medicinal oil such as castor oil, cod-liver oil, or mineral oil is emulsified by agitation with a soln. of casein in H_2O containing $NaHCO_3$, or with raw egg, egg white, egg yolk, or redissolved dried egg, and the emulsion is passed through a homogenizer under high pressure, dried under vacuum, and pulverized. The soln. of albuminous material used contains more albumin relative to the H_2O than does ordinary milk. Preferably a soln. containing 20–33% of casein is employed. The finished product contains 50–60% of oil. Flavoring such as oil of cinnamon may be added. The powdered products are stated to form stable emulsions when mixed with H_2O .

Immunizing preparations. A. STRUBELL. Brit. 148,203, July 9, 1920. Milk which confers immunity to tuberculosis is obtained by treating a cow for a period of months prior to and after calving with relatively large and increasing doses of a vaccine containing killed human fatty tubercle bacilli or, preferably, disintegrated or opened-up preps. thereof containing the whole of the partial antigens, both sol. and insol. The milk of such an animal contains both antigens and antibodies and confers active immunity on a person consuming it. A shorter period of treatment of the animal results in the milk containing antibodies only and conferring only passive immunity. Tables are given showing the doses of vaccine employed and the results of tests of the blood serum and milk serum of the cow and of the blood serum and reactions of the calf. The specification describes also a known process for obtaining an immunizing milk in which the cow is treated with a vaccine containing only the water-sol. partial antigens of the disintegrated bacilli and the toxin thereof. The method of obtaining such vaccine from the bacilli and from the culture medium by cold processes and by processes involving heating is described in detail, and a table of the doses employed is given.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

T. LYNTON BRIGGS

The synthesis of ammonia. ED. LIÉVENIE. *L'âge de fer* 36, 594–8(1920).—An account and discussion of the Claude modification of the Haber process for the synthetic prepn. of NH_3 . W. H. ROSS

Ammonia and the amines obtained by the dry distillation of vinasse. J. LAJBI. *Chem. Listy* 14, 58–61(1920).—The total N in the vinasse varied between 4.01 and 4.10%. 0.50–0.73% of this was distributed between NH_3 and the amides. The main quantity of these was formed during the dry distn. of the vinasse according to the method of Bueb and Reichardt at around 500°. This formation was due to the decompn. of various N complex compds. A part of these volatile N products was found in the water condensate, the remainder entering the gaseous products of distn. 25% of water condensate and 40% of gases were formed during the distn. The condensed liquor contained about 1.5% of N as NH_3 and amines. $\frac{2}{3}$ of the N was NH_3 , $\frac{1}{3}$ as various amines, mainly methylamine. The amts. of di- and trimethylamines formed were insignificant. At a temp. of 800–1000° these amines decompd. to form HCN. L. claims that this reaction was aided by the catalytic action of finely pptd. C formed during the distn. The NH_3 and the undecompd. amines were trapped by a H_2SO_4 soln. to which also was added the condensate. From this liquor the $(NH_4)_2SO_4$ was crystd. out and centrifuged. A yield of 2.5–3.0% of $(NH_4)_2SO_4$ was obtained based on the vinasse. The two other products of the distn., the C and the tar (yields equalled, resp., 30% and 5%) contained N in different forms. The C, by heating to 500–600° in the presence of steam yielded

about 1.5% of $(\text{NH}_4)_2\text{SO}_4$ based on the vinasse. The tar which contained from 5 to 6% of N was subjected to a second distn.

JOHN M. KRVO

Poisonous gases from carbon tetrachloride fire extinguishers. A. C. FIELDBER, S. H. KATZ, S. P. KINNEY AND E. S. LONGFELLOW. U. S. Bur. Mines. *J. Franklin Inst.* 190, 543-65 (1920).—Men fighting fires with CCl_4 have been overcome and even killed by the fumes. Study was made of the products obtained by the decompn. of CCl_4 when that compd. was used as a fire extinguisher. The liquid was applied to actual fires or to hot metal in a closed room of 1000 cu. ft. capacity where the gaseous products mixed with air could be retained and analyzed. The vapors of CCl_4 mixed with air were also passed through heated tubes of Fe or quartz; the humidity of the air and the temp. were controlled; and the products were detd. The air in the closed room was found to contain the intensely poisonous COCl_2 in toxic quantities, smaller amts. of poisonous Cl and also the irritating poisonous HCl, as well as considerable vapor of CCl_4 (a dangerous anesthetic). These results were substantiated by the tube expts., in some of which one-half of the CCl_4 was decomposed into poisonous gases. While CCl_4 extinguishers are excellent for stopping incipient fires, a danger is attached to their use; and they should not be used on fires in closely confined spaces where the user cannot escape without breathing the fumes. Good protection from the fumes is given by the army type of gas mask.

JOSEPH S. HEFURN

Hygiene precautions to be observed in the manufacture and industrial use of carbon disulfide (BLAIN) 13.

Catalytic oxidation of ammonia. C. S. PIGGOT. U. S. 1,357,000, Oct. 26. A mixt. of NH_3 1 and air 10 vols. is brought into contact with a catalyst composed of Mn 65, Cu 25 and Ag 10 parts, alloyed together, at a rate which will permit a sufficient contact time to bring about oxidation at a temp. of about 750-900°. The gases pass from the catalyst to reaction chambers where an additional amt. of air is admitted about equal to the amt. originally used with the NH_3 . The reaction mixt. is then treated with steam in order to convert the higher oxides of N into HNO_3 and subsequently the oxides which still are unconverted and any HNO_3 which remains uncondensed are absorbed by caustic alkali. A layer of catalyst about 0.125 in. in thickness is suitable, with a supply of gas so regulated that it remains in contact with the catalyst about 0.01 sec.

Catalytic production of ammonia. BADISCHE ANILIN- UND SODA-FABRIK. Ger. 306,333, June 18, 1916. Addition to 291,582. In an app. for the catalytic production of NH_3 , a steel rich in Ni and containing also large amts. of other suitable metals such as Cr, W, Mo or V, is used as the catalytic agent. A preferred compn. is W 5% and Ni 5%.

Alkali metal silicates. F. J. PHILLIPS AND E. J. ROSE. U. S. 1,357,183, Oct. 26. In the manuf. of alkali metal silicates or hydrated silicates, Na_2CO_3 or K_2CO_3 and borax are fused and ground with silica and H_2O and the soln. is agitated with gelatinous silicic acid.

Magnesium sulfate. W. R. COLLINGS AND J. A. GANN. U. S. 1,356,907, Oct. 26. MgSO_4 is produced by treating $\text{Mg}(\text{OH})_2$ with SO_2 and then oxidizing the $\text{Mg}(\text{HSO}_4)_2$ so produced by a current of air.

Lead arsenates, etc. W. THUM, J. J. MULLIGAN AND H. M. SCHLICHER. U. S. 1,356,569, Oct. 26. Arsenates of Pb or Ca or other metal having an insol. sulfate are prepd. by reaction on the sulfate, e. g., PbSO_4 or CaSO_4 , in the form of an aq. pulp, on a Na arsenate. The reaction is preferably carried out in a ball mill or similar app. with heating to a temp. of about 100° or somewhat lower.

Separating sodium and potassium nitrates. R. P. CALVERT. U. S. 1,356,906,

Oct. 26. Mixts. containing at least 20% of mixed nitrates of Na and K are treated so as to utilize the difference of soly. of the nitrates at a low temp., *e. g.*, a temp. of about -15° , so as to sep. crystals of KNO_3 from mother liquor containing NaNO_3 .

Ammonium nitrate. F. A. FREETH. Brit. 149,095, May 20, 1919. In the manuf. of NH_4NO_3 from NaNO_3 and $(\text{NH}_4)_2\text{SO}_4$, after removal of pptd. Na_2SO_4 as Ca Na sulfate, the soln. is then cooled, preferably without diln., to ppt. pure NH_4NO_3 . A nucleus soln. may be employed as described in 126,678 (C. A. 13, 2424). Cf. 117,649 and 131,956 (C. A. 14, 320).

Aluminium sulfate. G. MUTH. Brit. 149,001, July 12, 1920. $\text{Al}_2(\text{SO}_4)_3$ is obtained by treating uncalcined aluminous materials such as clay or bauxite with H_2SO_4 or solns. of bisulfates in open vessels in presence of a small quantity of a fluorite compd. such as H_2F_2 , fluorspar, silicon fluoride or other fluoride.

Alumina from clay. V. M. GOLDSCHMIDT and O. RAVNER. U. S. 1,357,089, Oct. 26. Clay or kaolin is calcined at a red heat, lixiviated with HNO_3 to form an Al nitrate soln. and the latter is converted into alumina by calcining or pptn. with NH_4OH .

Recovering titanium from ores. O. T. COFFELT. U. S. 1,357,690, Nov. 2. Ores such as ilmenite containing both Ti and Fe are digested with H_2SO_4 of a strength of 77–85% and Ti is recovered from the composite soln. of Ti and Fe sulfates thus formed, by adding NaCl in solid form to the concd. soln. to form NaTi sulfate which crystallizes out.

Apparatus for the manufacture of magnesium powder. D. S. NICOL. U. S. 1,356,780, Oct. 26.

Oxygen; hydrogen. G. F. JAUBERT. Brit. 148,564, July 10, 1920. In the purification of O which contains a small quantity of H or of H containing a small quantity of O by passing the gas over a catalytic material, the heat liberated by the reaction is utilized for maintaining the temp. of the catalyst, thereby permitting of the use of poor contact material with little or no external heating. To this end, the elec. heating resistance surrounding the catalytic material is embedded in heat-insulating material, and the whole is enclosed in a chamber provided at the bottom with a heat regenerator comprizing a nest of tubes. The impure gas passes through tubes to the catalyst, then circulates round insulating material and the tubes, and finally leaves the app. by a pipe. An elec. resistance coil is employed to raise the catalyst to the necessary temp. for starting the reaction, and may also be required to some extent for maintaining the desired temp. of reaction.

Nitrogen. L. CASALE. Brit. 148,885, July 10, 1920. N, or mixts. of N and H, are obtained by burning air in an atm. of H. Suitable app. is specified.

Carbon articles. DYNAMO-BÜNSTEN-FABRIK NÜRNBERG-REICHELSDORF SCHMIDT-HAMMER UND MAGNUS. Brit. 148,872, July 10, 1920. C articles for elec. purposes, for instance dynamo brushes, arc-lamp carbons, elec.-welding and other electrodes, and granules for microphones, are kept in motion during baking in such a way that uniform distribution of the binding material is maintained. A rotary furnace may be used for this purpose. Dynamo brushes may be made from a mixt. of powdered C and metals with tar, sirup, resin or light oils and alc. While being baked, they may be placed vertically and rotate about an horizontal axis.

Inert combustion gases. J. J. SHEA. U. S. 1,356,888, Oct. 26. An inert gas (mainly CO_2 and N) is obtained by mixing a combustible gas such as city gas with air in proportions for complete combustion without excess of air, burning the mixt. on refractory surfaces and removing H_2O vapor from the combustion gases thus obtained.

Regulating catalytic reactions of vapors and gases. F. A. CANON. U. S. 1,355,105, Oct. 5. Substances between which reactions are to be promoted are passed in the vapor or gaseous state into contact with the catalyst which is in the form of small particles, at such a velocity that the catalyst is picked up and swept along with the

substances. The catalyst may be sepd. from the products of the reaction or it may be removed from suspension by magnetic action or by elec. pptn. or it may be pptd. by decreasing its velocity and then returned to the reaction zone for further use.

Polish and grease- and tar-remover. G. F. LORD. U. S. 1,356,869, Oct. 26. A compn. adapted for use as a polish and for removing grease and tar, upon varnished or other surfaces, is formed of solvent naphtha 80% and lubricating oil 20%.

Vegetable glue. V. G. BLONDE. U. S. 1,357,310, Nov. 2. A smooth paste or cream is made of starch with cold H_2O carrying in soln. $FeCl_3$, $Fe(NO_3)_3$ or a similar salt of a starch-coagulating base, this mixt. is heated to about 100° to form an undigested starch jelly and the latter is then treated with NH_4OH or other compd. which will liberate the starch-coagulating base and effect a uniform and smooth coagulation of the starchy material.

Strengthening and waterproofing wood. M. AROSIO. U. S. 1,356,847, Oct. 26. Wood or other fibrous material, *e. g.*, airplane propellers, is bandaged with vulcanized fiber and then treated with a coating of celluloid or acetylcellulose. Cf. C. A. 14, 359.

Waterproofing composition. B. F. DODGE. U. S. 1,357,852, Nov. 2. A compn. suitable for waterproofing sealed or wrapped articles is formed of pitch 10-25%, paraffin 30-60%, carnauba wax 5-15% and rosin 10-30%.

Preservative and waterproofing compositions. C. H. MURRAY. Brit. 147,310, May 1, 1919. A preservative and waterproofing compn. for application to paper, textiles, wood, metal, stone, plaster, cement, etc., consists of an emulsion of soap soln., resin and wood or tung oil. A soln. of a colloid, such as a soln. of casein in NaOH containing a preservative such as boric acid, is added when the compn. is to be used as a paint. Fillers and pigments may be added.

Molding gypsum, cement, etc. A. HAENICKER. Brit. 148,797, July 10, 1920. In the production of small shaped articles, *e. g.*, buttons, from gypsum, cement, etc., the finely ground material is pressed in a dry state, the pressed article is removed from the mold and subjected to a spray of H_2O or setting liquid until just sufficient liquid for setting has been absorbed. Burnt magnesite may be employed, a lye of $MgCl_2$ being employed as a setting liquid.

Horizontal tubular furnace for manufacturing rouge by calcining iron sulfate. C. L. WAINNER. U. S. 1,357,664, Nov. 2.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, A. V. BLEININGER

Some developments in the study of glass technology in the year 1919-1920. W. E. S. TURNER. *J. Soc. Glass Tech.* 4, 287-96(1920).—This comprises the 4th annual report of the Delegacy for Glass Research. Statistics are given on papers published, investigations made, and educational work in glass technology. E. RODGERS

The factory inspection of glassware. W. E. S. TURNER. *J. Soc. Glass Tech.* 4, 253-61(1920).—According to the class of ware being made, tests from the following list should be applied: poor color; uniformity of capacity; test of size of neck by a standard gage; uniformity of thickness; cracking test; detn. of bursting pressures; accuracy of graduation; absence of seeds, blisters, and cords; examn. in the polariscope for state of annealing in the case of glass other than dark metal. The cracking test is applied by filling the bottle with water, heating it slowly to not less than 70° , and chilling it suddenly in water at 20° , afterwards repeating the test at 75° and 80° if the bottle has not previously been cracked. Good bottles should withstand sudden chilling from 75° to 20° without cracking. The cracking test is really a test

both of the uniformity of thickness and of the state of annealing, and is the only method of obtaining evidence on the state of annealing when the bottle is too dense in color to permit of examn. by the polariscope.

E. RODGERS

Certain surface effects in glass, probably produced by reheating in the glory hole. MORRIS W. TRAVERS. *J. Soc. Glass Tech.* 4, 284-6(1920).—In glasses that have been worked in glory holes, small bubbles appear immediately below the outer surface. It is suggested that this is due to the evolution of dissolved gases due to the fact that the surface of the glass is intensely heated by radiation from the burning coal or coke, the glass as a whole being opaque to radiation.

E. RODGERS

Note on the density of soda-magnesia glasses. C. J. PEDDLER. *J. Soc. Glass Tech.* 4, 281-3(1920).—The densities of a series of glasses containing five mols. of SiO_2 were found to be as follows (the figures show mols. of Na_2O , mols. of MgO and d., resp.): 1.75, 0.25, 2.453; 1.625, 0.375, 2.448; 1.50, 0.50, 2.444; 1.375, 0.625, 2.439; 1.25, 0.75, 2.433; 1.00, 1.00, 2.421. From a study of these results and comparison with those obtained by English and Turner (see *C. A.* 14, 3509) the following conclusions were drawn: In glasses where the mol. SiO_2 and Na_2O content remains constant, increasing the mol. content of either MgO or CaO raises the d. Where the SiO_2 , MgO or SiO_2 , CaO content is the same in two glasses, the one with the higher mol. Na_2O content will have the higher d. The rate of increase of density per mol. of CaO added is much greater than the rate of increase per mol. of MgO added. The rate of increase of d. diminishes in both the MgO and CaO glasses as the amt. of MgO or CaO increases, and this diminution is not marked in the series containing the most Na_2O . In two like series of CaO and MgO glasses, the CaO glasses have a higher density than the MgO glasses. E. R.

Device for measuring the internal diameter of glass tubing. VERNEY STOTT. *J. Soc. Glass Tech.* 4, 261-3(1920).—The instrument consists of a thin-walled brass tube in which a rod carrying a cone at its lower end is free to move. A brass ring is soldered into the bottom and attached to this are three springy brass wires placed on radii which make angles of 120° with each other. These wires are all of the same length, and at the upper end of each a phosphor-bronze ball is fixed. As the cone is pushed down the tube, it comes into contact with the 3 balls, and presses them outwards as it descends. The tube is cut in order to allow the phosphor-bronze balls and the wires attached to them to move freely in and out. When the instrument is placed with its lower end inside a glass tube, the cone can be pushed in until each ball is in contact with the inside of the glass tube, but when this happens the cone can descend no further. The diam. is then read off on the scale engraved on the rod. A ferrule is made so as to be a spring fit on the outside of the tube. This facilitates the measurement of internal diams. at any desired distance from the end of the tube to be measured. The instrument is graduated and calibrated by the aid of standard ring gages.

E. RODGERS

Automatic feeding devices for glass-making machinery. HOMER BROOKE. *J. Soc. Glass Tech.* 4, 296-8(1920).—The utilization of a flowing stream of molten glass from the furnace and cutting from it predetd. quantities of glass at a definite rate (30 to 90 per min.), the portions of glass then being served to automatic machines to make ordinary articles of glassware, has been successfully carried on for a number of years in the U. S. and Canada under patents granted to B. in the U. S., Canada, Great Britain, France, Belgium and Germany. The patents have now expired and are, therefore, open to all freely to utilize them.

E. RODGERS

Glass manufacture and the glass sand industry (of Pennsylvania). C. R. PETTKE. *Topographic and Geol. Survey of Penna.* Rept. 12, 278 pp.(1919).—P. has made an extensive field study of the glass sand deposits and workings in Penna. The more important central deposits are in the Oriskany sandstone, the western in the Pottsville. The Tuscarora sandstone is a hard quartzite which cannot be economically crushed to glass sand. The Oriskany deposits are believed to have been derived from the Tus-

carora and their purity is attributed to this origin. They are often very pure but in all cases washing is necessary to produce No. 1 sand. Only weathered portions of the deposits are workable, the unweathered being hard quartzite. The report is extensively illustrated and includes a detailed description of glass manuf. including the more recent developments, such as machine-blown glass.

J. S. LAIRD

Optical glass and its future as an American industry. ARTHUR L. DAY. *J. Franklin Inst.* 190, 453-72(1920).—An account of the work of the silicate chemists of the Geophys. Lab. of the Carnegie Inst. of Washington in studying optical glass and in controlling the domestic production of approx. 650,000 lbs. of such glass during American participation in the great war. Attention is also paid to the future of this industry in the U. S.

JOSEPH S. HEPBURN

High-grade silica materials for glass, refractories, and abrasives. R. J. COLONY. *N. Y. State Museum Bull.* Nos. 203-4, 29 pp.(1919).—The siliceous formations exposed in New York State have been studied with a view to det. how far the demand for siliceous materials could be satisfied from these deposits. *Glass sand* suitable for common glass occurs in the region of Oneida Lake in relatively small deposits. *Sandstone* of sufficient purity for glass making and easily crushed, occurs near Johnstown (Potsdam) and at Oriskany Falls (Oriskany). *Quartzite* with a firmly interlocking structure and of sufficient purity (95-99% SiO_2) for refractories occurs in large quantities in Dutchess County (Ponghquag) and near Accord (Shawangunk). Most of the deposits contain rock suitable for use in the manuf. of ferrosilicon. The harder quartzites (Ponghquag) appear suitable for tube-mill liners. No actual tests were made except a few tests for hardness and toughness. Chem. analyses of the various deposits are given and numerous photomicrographs of thin sections.

J. S. LAIRD

Porcelain insulators. O. BOUDOUARD. *Rev. gén. élec.* 1920, 681-6; *Science Abstracts* 23B, 342.—Tests on 31 samples of American, French and German makers, from various transmission companies are discussed. Six tables give their types and characteristics, chem. analyses, compn. referred to SiO_2 as 100, aspect of fracture and physical appearance, cause of failure, and explanation of defective performance. Compn. varied widely: SiO_2 , 63.3 to 74.5%; Al_2O_3 , 20.5 to 29.8; CaO , where intentionally present, 1.9 to 4.0; alkalis 3.2 to 6.5; the variations are more striking referred to $\text{SiO}_2 = 100$. Defective specimens were high in SiO_2 or CaO . Since quartz is piezo-electric and feldspar liable to electrolysis, substitution should be made with sillimanite, kaolin, alumina or zirconia, and with Al, Mg, Be or alk. silicates, resp. This development has been made by American ceramists, who adhere most closely to Watts' porcelain formula: $\text{RO} \cdot 4\text{Al}_2\text{O}_3 \cdot 16\text{SiO}_2$. Close attention to these results appears profitable. F. H. H.

Factors controlling the design and selection of (porcelain) suspension insulators. W. D. A. PRASLEE. *J. Am. Inst. Elec. Eng.* 39, 571-9(1920).—The factors governing rational porcelain insulator design and insulator shape as affected by the elec. field of force are discussed. The development of a rationally designed suspension insulator, its proper testing, and its operating characteristics with a discussion of possible future progress is also described. Curves showing potential distribution, impulse ratio, puncture voltage and flash-over are given.

W. E. RUDER

Testing (porcelain) insulators in factory and field. LESLIE N. CRITCHON. *Elec. J.* 17, 506-10(1920).—Description of standard methods.

C. G. F.

Surface leakage as a factor in (porcelain) insulator design. T. M. FRIDER. *J. Am. Inst. Elec. Eng.* 39, 803(1920).

C. G. F.

Experience with porcelain insulators in America. F. W. PEEK, JR. *Elec. World* 76, 1061-4(1920).—8 illus. A full discussion of tests on and the behavior of porcelain insulators.

C. G. F.

Features of European (porcelain) insulator testing practice. B. SCHAFFNER. *Elec. Rev.* 77, 721-4(1920); 8 illus.

C. G. F.

Physical characteristics of refractories. I. Spalling losses. II. Cold and hot abrasion tests. M. L. HARTMAN AND O. A. HOUGEN. *Trans. Am. Electrochem. Soc.* 36, preprint(1920); cf. *C. A.* 14, 2246.—I. Comparative tests were made on 12 different kinds of refractory bricks purchased in the open market, exposed to rapid cooling, in an air blast, from a temp. of 1350°. Three of these kinds were completely disintegrated at the 7th, 4th and 3rd treatment. The others were treated 10 times. The three bonded carborundum varieties showed the least spalling (under 8%). Chrome brick was all gone after the 7th test, silica after the 4th, and magnesia after the third. II. A carborundum cutting wheel was used for the hot and cold abrasion tests and the abrasion in a given time, under equal pressures, noted. Again the bonded carborundum gave the best results. In discussion, it was brought out that this test was probably very much affected by differences in heat cond. W. E. RUDER

Colored glass. K. WARGA. *Brit.* 148,304, July 9, 1920. Colored designs are formed on glass surfaces by fusing the colors on at one operation. The designs are formed of fusible mineral colors and are built up in successive layers on transfer paper. The complete design is then transferred to the glass surface and fired at a gradually increasing temp. until it is completely fused on. The layers are composed of materials which melt at successive temps., the layer next the glass melting first and the outer layer last. The temp. at which the last layer melts is about 100° below the m. p. of the glass.

Glass, enamels, and glazes. E. RIETZ. *Brit.* 148,816, July 10, 1920. Relates to the manuf. of white clouded glass, enamels, and glazes. Fluorides are used in conjunction with compds. of Zr, Sn, Be, etc. Alkali fluorides, alkali silicofluorides, CaF_2 , and cryolite are stated to be suitable compds. for use. A frit, given as an example, consists of Na_2CO_3 , feldspar, quartz, natural zirconia and sodium silicofluorides. The F compds. are used in larger proportions than has hitherto been done. The batches must contain a large proportion of SiO_2 .

Abrading tools. NORTON CO. *Brit.* 148,387, July 9, 1920. Abrasive materials, such as Al_2O_3 and SiC , are bonded with a mixt. of shellac and plaster of Paris or like material. In an example, the finished grinding wheel or other tool contains 3-20% of plaster of Paris and 12-30% of shellac. The product is heated so as to melt the shellac, and the whole may then be subjected to pressure and the wheel baked at a temp. of 300-350° F.

Refractory material. J. L. OHMAN. U. S. 1,356,939, Oct. 26. A non-crystd. refractory material suitable for retorts or furnace linings is formed of SiC 68, graphite 25 and clay 7 parts.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Effect of alkali water upon concrete. B. F. ERDAHL. *Concrete (Mill. Sec.)* 17, 123-4(1920).—Discussion of a former article by E. C. A. 14, 2979. J. A. M.

Deteriorating effects of acids (and salts) upon concrete. C. A. HEISS. *Berlin. Concrete* 17, 169(1920).—An investigation conducted by the German Concrete Association shows that practically all acids attack concrete. The higher the temp. the greater is the speed of the attack. Acids which form sol. Ca salts attack concrete much more rapidly than acids which form insol. Ca salts. (The last class forms a protective coating.) Some of the worst enemies of concrete were found to be HNO_3 , HCl and CH_3COOH . Less dangerous acids are H_2SO_4 , H_2SO_3 , H_2F_2 , etc. Milk was shown to possess destructive properties by producing acidifying effects. Sugar and benzine attack concrete. Alkali carbonates do not attack concrete; CaCl_2 , KNO_3 and NaNO_3 are also considered

to be non-injurious. $MgCl_2$ and sol. sulfates such as K_2SO_4 , Na_2SO_4 , and $FeSO_4$ are injurious. In contradiction to the above statement that K_2CO_3 and KNO_3 are non-injurious, it is stated further in the article that all K salts are destructors. $NaCl$ is not harmful. "Whenever acids of a highly concd. form were used protective coatings were practically useless and covers of lead, ebonite, or acid-proof ceramic slabs with their joints filled up by acid-proof cement, became necessary." (The article as it appears in *Concrete* is not the original but apparently a review of the original.—J. A. M.)

J. A. MONTGOMERY

Proportioning concrete aggregates when unscreened or pit-run gravel is used.

L. A. DOAN. *Eng. Contr.* 54, 534(1920).

J. A. MONTGOMERY

Concrete tanks hold light flask oil. ANON. *Concrete* 17, 171(1920).—During a two-year test, 3 concrete tanks 37 ft. in diam. and of 125,000 gal. capacity at the Trafford City foundry of the Westinghouse Electric & Mfg. Co., have proved satisfactory as fuel-oil containers. A concrete hardener was used on the surface. "The best method of stopping seepage is the use of high-grade concrete, with the walls poured without any stopping, so that there will be a monolithic wall." The tanks held light flask oil as easily as heavy fuel oil.

J. A. MONTGOMERY

Further discussion of "Cal." S. W. STRAYTON. *Concrete (Mill Sec.)* 17, 125 (1920).—Cal is obtained by grinding the dried or undried product resulting from a mixt. of either quicklime or hydrated lime, $CaCl_2$ and H_2O . It can be used to advantage to hasten the set of portland cement. Five % of cal added to a cement mortar increases the strength test at 2 days from 40 to 140%. It has the advantage over $CaCl_2$ in that it is less hygroscopic and can therefore be more easily handled. J. A. MONTGOMERY

The manufacture of lime for chemical and metallurgical purposes. III. RICHARD K. MEADE. *Chem. Met. Eng.* 23, 929-32(1920); cf. C. A. 15, 156—M. describes applications of the generally available fuels, pulverized coal and producer gas. Power consumption and cost data are given. Producer gas burns a clean lime of uniform quality, when well taken care of. The producer, if placed under a bunker, allows direct coal feed into the hopper of the producer. Radiation losses are reduced by having the producer near the kiln. A single large producer is preferable to two or more smaller ones. Advantages claimed for pulverized coal over producer gas are: a more uniform rate of supply of fuel; elimination of the loss of C in the ash; ability to burn with almost the exact quantity of air necessary for combustion; and in the producer a loss of coal due to C completely burned to CO_2 occurs. The efficiency of a producer compared with pulverized coal is less than 85%. Two general systems of pulverized-coal installations are those in which the coal is pulverized and blown into the kiln in one operation, and those in which the coal is pulverized, conveyed to a bin and thence fed into the burner. Each type is illustrated. About 40% of the total energy of the coal burned is represented in the gas, 54% in decomposition of the limestone, and 6% in radiation. 70% of this waste is utilized by waste-heat boilers. It is equivalent to 1550 lbs. (705 kg.) of steam at and from 100° or 45 b. h. p. (hours). A rotary kiln requires 2800-3500 B. t. u. per ton of lime. This is better than that obtainable from hand-fired kilns and but slightly less than that claimed for the best gas-fired kilns. The most economical kiln shows the greatest ratio between length and diameter. W. H. BOYNTON

Economics of refuse destruction. P. M. GRIMPE. *Feuerungstech.* 8, 86-7(1920).—In consequence of the shortage of some of the principal building materials during the war, expts. were made in Germany with the clinkers produced by the destruction of refuse in municipal incinerators. Particularly successful results were obtained in the town of Fürth. The clinkers contained 55.6% SiO_2 , 11.7% Fe_2O_3 , and 13.9% Al_2O_3 . Of the SiO_2 , 2.15% is sol. in Na_2CO_3 and 3.11 (together with 1.80% Al_2O_3) sol. in 30% KOH, showing the presence of hydraulic silicates. The clinker inhibits rusting and, therefore, is suitable as an aggregate for reinforced concrete. They have been used in

the manuf. of paving stone, curbstones for pavements, covers for conduits, etc. In tests with concrete, prepd. from mixts. of cement, sand and clinker in the proportions 1:2:4, 1:3:6 and 1:4:8, the crushing strength after keeping for the periods mentioned, in a moist condition, were, resp.: 28 days, 232, 139, and 55.6 kg. per sq. cm.; 90 days, 288, 171, and 71.2; 1 year, 322, 190 and 94 kg. C. J. West

Corrosion of concrete by sewage (Rept. of Egyptian Government laboratory, etc.)
13.

BLOCK, BERTHOLD: *Das Kalkbrennen im Schachtofen mit Mischfeuerung*. Otto Spamer, Leipzig. 240 pp. For review see *J. Fabr. Sucre* 61, No. 34.

MÜLLER: *Der Schachtofen in der Zementindustrie*. Charlottenburg: Zement-verlag G. m. b. H. 68 pp. M. 5.50. For review see *Tonind.-Ztg.* 44, 1073(1920).

Fiber-cement slabs, etc. E. STRIGER. *Brit.* 149,120, June 26, 1919. In the manuf. of tiles, flags, etc., from a mixt. of cement and asbestos or other fiber, wherein CO₂ is caused to act on the tiles, etc., a feature is made of having the tiles in the condition of not being satd. with H₂O, but containing more than 2% thereof. Cf. *C. A.* 23,559, 1912 (*C. A.* 8, 1337).

Roofing material. H. ABRAHAM. U. S. 1,357,920, Nov. 2. A roofing material is formed of a layer of felt satd. with bituminous material, and a compacted coating layer consisting of bituminous material containing not over 20% by wt. of non-felted fibrous material. The coating layer is thicker than the felt layer.

Building material from plaster of Paris. M. BAER. U. S. 1,357,375, Nov. 2. A building material especially adapted for use in ship-building is formed of plaster of Paris mixed with chips or particles of wood and metal.

Pliant floor-covering material. L. OLTMANS. U. S. 1,356,784, Oct. 26. In prepg. a material suitable for covering floors, a dil. glue soln. is mixed with a filler such as wood flour or cork powder and this mixt. is then incorporated with a heavy glue. Sheets of the mixt. may be attached to a fabric backing.

Treating refuse. J. B. C. KERSHAW. *Brit.* 149,033, Oct. 11, 1919. Slag containing 40% of SiO₂ and 15% of CaO and MgO is obtained by burning refuse in a refuse destructor with CaO-containing material such as limestone, chemical waste or road sweepings, 100 tons of refuse being mixed with 8 tons of limestone or its equiv. of lime-containing material before being charged into the destructor. Low-grade carbonaceous material such as slack, coke breeze, peat or wood refuse may be added to the refuse. The slag produced may be run from the destructor into molds to form building blocks and slabs or articles of any desired shape. Preferably the slag is run into a series of Fe molds formed by molding pieces placed on edge on the ground, the molding pieces having thickened ribs at corners to strengthen them and leave air spaces between the adjacent sides when placed in rows. The slag may be treated in its molten condition with superheated steam by allowing a steam jet to play on the slag and thus reduce it to a fine amorphous powder ready for use in the mixing of cement or mortar. The slag may also be granulated by passing it into a jet of cold H₂O.

21—FUELS, GAS, TAR AND COKE

J. D. PENNOCK

Coal as a source of new chemical raw materials. FRANZ FISCHER. Mülheim. *Brennstoff Chem.* 1, 31-9, 47-52(1920).—The striking difference in compn. of the fuels ranging in age from peat to anthracite is apparent from their greatly varying behavior with solvents and on destructive distn. For instance, they range from practically

zero sol. in benzene (gas coal) to 15% or more sol. (Lausitz brown coal); from zero to 87% (same brown coal) sol. in cold dil. NaOH. Low-temp. distn. shows the same large variations in the properties of the tar produced; gas coal gives a tar which is almost 50% alkali-sol., while brown-coal tar contains only 10-15% of these phenols and resins. The aq. distillate contains little NH_3 , but rather pyrocatechol, or in the case of brown coal, MeOH. After describing lab. and plant equipment for low-temp. distn., and mentioning the various processes for distg. the tar, with or without cracking, the author tabulates the compn. of the 45% phenolic fraction of a low-temp. gas-coal tar as follows: Phenol 0.06%, cresols 1-2%, xylenols 1-2%, pyrocatechol 0.25%, higher-boiling than xyleneol 30-32%, acid resins 10%. Since these high-boiling, unidentified phenols may be recovered in a quantity of 50 kg. per ton, their utilization becomes an important problem. It is doubtful if so large a production could be used in the shape of condensation products. The hydrocarbon fraction from 200 to 300° is only 12-13% insol. in fuming H_2SO_4 , indicating that the hydrocarbons are not so exclusively of the satd. group as has been supposed. When powdered coal is suspended in NaOH soln., heated to 200° under pressure and oxidized by a current of air, sol. products and gases are formed rapidly; thus peat gives 24% water-insol. acids, 6% water-sol., ether-extractable acids, 6% acetic and formic acids, 11% CO_2 and 8% residue, while a gas coal gave 6%, 3%, 3%, 8.5% and 85.5%, resp. On further oxidation of the latter, a clear yellow soln. was finally obtained, in which HCOOH , AcOH , BuOH , BzOH , phthalic acid, mellophanic acid, mellitic acid, humic acids, and acid resins were identified. Cellulose and sugar gave the same oxidation products. It was found that the bitumens extd. from coal were oxidized mainly to fatty acids, while the extd. coal gave the aromatic acids mentioned. The gases formed during low-temp. distn. are distinguished by a low H-content, the presence of benzene instead of benzene vapors, and the high content of unsatd. (up to 15%) and satd. (up to 75%) hydrocarbon gases. The author discusses briefly the outstanding chem. problems in connection with producer gas, recovery of NH_3 and the properties of various metallic carbides. W. B. V.

Pulverized coal as a fuel. LAW FORD H. FRY. *Engineering* 110, 628-31(1920).—Powdered coal is compared with the fuels with which it competes, viz., hand- or stoker-fired coal, natural gas, producer gas and oil. The usual objection that pulverized coal may cause an explosion is somewhat unjustified since it offers practically no greater hazard than oil or gas. F. presents a detailed survey of the problems of pulverizing, transportation and combustion. American practices are discussed with diagrams to show methods of applying this fuel to heating furnaces and in power-plant construction. S. D. KIRKPATRICK

Alcohol as a motor fuel. H. B. DIXON. *J. Soc. Chem. Ind.* 39, 355r(1920).—A lecture delivered before the Imperial Motor Transport Council of London in which are discussed the results of researches comparing alc. and its mixts. with gasoline and other hydrocarbons as motor fuel. Vapor-pressure curves were ascertained for pure alc., pentane, hexane, ether and various mixts. Ignition temps. were detd. by heating at atm. pressure and by adiabatic compression. Alc. possesses most of the properties required in a motor fuel. Its lower calorific value is almost compensated by the greater compression at which it can be used, a property which is not altered by admixt. with 20% C_2H_4 or with gasoline. Also in *Chem. Age (London)*, 3, 450(1920). S. D. K.

Benzene-alcohol experiments on omnibuses. G. J. SHAVE. *Engineering* 110, 623-4(1920).—A second paper presented before the Imperial Council discusses fuel expts. carried out by the London General Omnibus Co., Ltd. Compared with gasoline both benzene and alc. are slow-burning fuels and the construction of the engines has to be modified to suit their use; in most cases compression must be increased. Bench tests with a standard type of engine showed that the greater the percentage of alc. (1) the higher are the thermal efficiencies for the same compression and (2) the higher

the compression can be raised with consequent rise in thermal efficiency. Road tests made by transferring the engine to a truck chassis were followed by service tests on 14 busses. After a month the fuel tanks became porous, due to corrosive action of the fuel (mixt. of 50% alc. and 50% C_6H_6). Further tests showed that the brass carburetors were not attacked but that the tanks and pipes should be lead-coated for best results. A thick tar-like deposit in the inlet valve pockets proved the necessity of periodical examn. and cleaning. Engines operated with alc.- C_6H_6 mixts. showed noticeable absence of knocking even on hills at low speeds. Notwithstanding high compression they were easy to start. It is difficult to compare costs because of abnormal market conditions and the fact that alc. is subject to tax. However, assuming equal costs per gal. (25 d.) it was found that while gasoline costs 8% less than the 50% mixt. on B. t. u. basis, the latter gives better operating results.

S. D. KIRKPATRICK

Natural gas and natural-gas gasoline in 1918. E. G. SKYERS. U. S. Geol. Survey, *Mineral Resources of the U. S.*, 1918, Pt. II, 1393-1437 (preprint No. 36, publ. 1920).

E. J. C.

Manufacture of neutral sulfate of ammonia. E. V. EVANS. *Gas J.* 152, 515-20 (1920); *Chem. Age (London)* 3, 588-9(1920); *Gas World* 73, 422-6(1920).—The process as described provides for neutralizing the sulfate by condensing the vapors from the fixed NH_3 still, dilg. the soln. of NH_3 thus obtained until it loses practically no NH_3 at the temp. at which it is used, and then washing the crystals of $(NH_4)_2SO_4$ in the centrifugal machine at 75°. The condensing system consists primarily of a serpentine condenser connected to the NH_3 still and discharging its condensate into a blow-pot where it is dild. and then sprayed on to the bed of salt in the centrifugal. The condensate is essentially a NH_4OH of fairly pure character depending upon the temp. to which the ammoniacal liquor is preheated, the efficiency of the free still, and the time contact and efficiency of the liming process. Eight gal. of the NH_3 soln. containing 0.5% of NH_3 is sufficient to neutralize 8 cwt. of salt containing 0.4% H_2SO_4 . During neutralization small amts. of NH_3 escape, but the evolution of pyridine by decompn. of pyridine sulfate and its replacement by NH_3 is the chief objection. It is advisable to install an exhaustor over the centrifugal machine. To neutralize the salt, it is discharged directly from the saturator into the centrifugal and is whizzed for 2 min. at full speed to remove the major part of the acid mother liquor. The speed is then reduced while the NH_3 soln. is applied, after which drying is completed at max. speed. The salt is then discharged to a drying tower and dried by hot air at 150° until its moisture content falls from the 1-1.5% on leaving the centrifugal to 0.04%. The cost of neutralizing is 4 d. per ton, that of drying 11 d. A thoroughly dry, colorless and crystalline salt is produced which does not cake and resembles very closely the product obtained from synthetic processes.

J. L. WILEY

Silent aerated (gas) flames. H. DAVIES. *Gas J.* 152, 395-7(1920); *Gas World* 73, 387-8, 407-9(1920).—As the result of studies made to det. the conditions most favorable to the production of silent combustion in a gas flame, it was found that for a single-tube flame noise depended primarily on the degree of aeration and rate of consumption of the mixt. A flame produced by the combustion of a homogeneous gas-air mixt. was noisy if a critical consumption depending upon the length and the bore of the tube was exceeded, this consumption reaching a max. corresponding to a particular compn. of the gas-air mixt. Considering this mixt., consumption increased as length of tube increased until a critical length was reached, after which the consumption was const. When lengths equal to or greater than the critical lengths of tubes of different diam. were compared, the consumptions producing the "just-silent" flames were not proportional to the cross-sectional areas, but were more nearly proportional to the diam. or internal circumference. A silent, steady aerated flame is defined as one in which the inner cone is everywhere bounded by a sharp line of demarcation, the flame when viewed

along its axis from above showing the existence of a centrally disposed black spot.

J. L. WILEY

Training of the gas works chemist. F. B. SMALL. *Gas World* 73, 433(1920); *Gas J.* 152, 524-5(1920).

J. L. WILEY

Internal heating method. JAMES F. REYNOLDS. Am. Gas Assoc., *Gas Record* 18, No. 10, 58-9 (1920).—The application of gas to heating liquids in wooden or metal tanks can be made by the use of the Reynolds submersible pressure blast gas burner. This app. consists of a pipe burner fitted with small burner tips and surrounded by a secondary air jacket, the whole being enclosed in a water-tight housing to permit of immersing in the liquid. Primary air and gas are admitted through respective pipes and mixed by means of an injector. Secondary air to support combustion enters the air jacket and finds outlet through a secondary air collar. Tests with a subaqueous burner in heating 720 lbs. of water 155° showed an efficiency of 54% with a gas consumption of 304.6 cu. ft. in 2 hrs. 10 min. An efficiency of 65% could be made by insulating the tank. A similar tank was heated with atm. burners with an efficiency of 30% and a gas consumption of 385 cu. ft. per hr. and a total consumption of 5400 cu. ft. for a like rise in temp.

J. L. WILEY

Heating of retort settings. Some theoretical considerations in the design of gas works plant. G. DOUGILL. *Gas J.* 152, 451-6(1920); *Gas World* 73, 428-9(1920).—The vertical retort lends itself most readily to efficient heating, the horizontal retort is most difficult, and the coke oven occupies an intermediate position. The efficiency of the horizontal retort is reduced by the supporting walls, and it is proposed that thinner walls at shorter intervals would produce better heating without diminishing the mechanical strength. In horizontal-retort plants where outside producers are installed, it would be well to follow coke-oven practice and build the retorts in vertical lines and the combustion chambers at each side of the retort with recuperators.

J. L. W.

Complete gasification of coal. Inerts. Sale by thermal units. L. S. P. J. *usines à gaz* 44, 273-83(1920); cf. *C. A.* 12, 1246.—Résumé of conferences and demonstrations made in March 1920 at London by Geo. Helps in support of his process for the complete gasification of coal, and his criticisms of the Fuel Research Board's recommendations. (*C. A.* 13, 1631.) The process as described is continuous, the coal being completely gasified in its passage through the retort and the gas produced being dild. by injection of steam and air into the retort. The gas does not suffer degradation, since it is drawn off as soon as formed. About 80,000 cu. ft. of a 330-B. t. u. gas is produced at a cost which will enable it to be sold for $\frac{1}{4}$ to $\frac{1}{3}$ the price which is now current. There is produced an undetd. amt. of liquid tar and ammoniacal liquor of a satisfactory grade. H. ests. that the cost of distribution of this dild. gas will be somewhat higher than for ordinary gas, due to the higher pressure required, but not, however, proportional to the dildn. H. criticizes the ruling of the Fuel Research Board that inerts must be limited to 12% and insists that gas can be dild. to a much greater extent, even up to 30%, without destroying its value either for heating or lighting, "one calorie being as good as another." He demonstrated this point by expts. By delivering a gas of lower calorific value, a considerable saving of coal can be effected; at Oldham by reducing calorific value from 600 to about 450 B. t. u. 46,000 tons of coal were saved in a year.

J. L. WILEY

Ammonia still waste liquor. E. A. DIETHELE. Koppers Co. Lab., Pittsburgh. *Gas Age* 46, 427-8(1920).—The objectionable properties of NH_3 still waste are due largely to the presence of phenols, thiocyanates, pyridine, etc., and can be detected by taste up to 1 part in 50-75 million of chlorinated water. The effect of slight traces of phenol in chlorinated city waters has probably been heretofore somewhat exaggerated. The total elimination of phenols is neither necessary nor practical. It should be sufficient to reduce their concn. to the point at which fish and other aquatic life are not ser-

iously affected, allowing the remaining traces to be destroyed by the usual course of oxidation. A preliminary settling to remove lime and suspended matter and their filtration through inorg. material such as lignite, peat, boneblack or bacterial filters to remove tarry matter, sulfides, etc., was found to be the most successful practical method of eliminating the objectionable properties to the point where the effluent could be turned into streams or other bodies of water. The work is still in progress.

J. L. WILEY

Automatic supply of steam in distillation of ammoniacal liquor. G. FRÈRE. Soc. Tech. du Gaz. *Gas J.* 150, 841-2(1920).—The steam supply from the boiler is connected with a tank open at the top, the level of water in which varies with the steam pressure. A pipe, having its lower end cut at an angle and partly sealed by the water in the tank, is connected by another pipe to the boiler furnace. As the water level in the tank varies with the steam pressure, the end of the first pipe is unsealed for part of the time allowing air to pass through to the furnace. If the steam supply is from an independent source, a similar device may be used except that in this case the tank is provided with a counterbalanced float which operates a valve on the steam supply pipe.

J. L. WILEY

Calorific power and testing of gas. The caloriscopes. E. V. EVANS. *Gas J.* 152; 511(1920); *Gas World* 73, 426-7(1920), illustd.—The instrument described is suitable for use in maintaining control over calorific value similarly to that afforded in the case of illuminating power by the jet photometer. The principle on which it is based has already been described (Brady, C. A. 14, 338, 3781). The disadvantage, however, of that app. was that its action was intermittent, and did not indicate changes in the quality of gas except by sep. complete tests. The great difficulty found in designing a recording calorimeter is due to the variation in the rate of flow of the gas resulting from a change in sp. gr. In the caloriscopes, advantage is taken of the fact that any alteration in the density of the gas is automatically corrected by a change in its inducing power. This is accomplished by providing a Bunsen burner with a good governor on the gas supply and a throttle in the form of a sensitive needle valve on the air inlet, the operation of which is recorded on a scale graduated in B. t. u. compared with a standard calorimeter. A calorific value detn. accurate to within 1 or 2% can be made in 30 sec. The instrument is being further simplified.

J. L. WILEY

Dempster-Toogood system installed at Hawick (Scotland). ANON. *Gas J.* 152, 445-6(1920).—Particulars are given of an installation of Dempster-Toogood continuous vertical retorts with steaming. Each retort is individually controlled as a complete unit and by its waste heat dries and superheats its own previously controlled steam with obvious advantage in formation of water gas with low CO₂ content. The operation is highly efficient.

J. L. WILEY

Disposal of gas-plant wastes. L. J. WILLIEN. *Gas Record* 18, No. 8, 31-4(1920); *Gas Age* 46, 349-52(1920).—Methods suggested by Am. Gas Assoc. for disposal of gas plant wastes to eliminate injurious effects to the community are given. Mention is made of the Sharples process for dehydration of water-gas tar emulsions. In one case the water content of a tar containing 25-50% of water was reduced to 0.5-5%. The process is especially efficient in sepg. emulsions from water-gas machine seals when using low-gravity residuum oils.

J. L. WILEY

Heat unit economy on gas works. K. BUNTE. *Gas J.* 152, 389-91(1920).—Translation of article in C. A. 14, 3779.

J. L. WILEY

The industrial determination of naphthalene. LEONCE FABRE. *Rev. chim. ind.* 28, 214(1919).—Simple and rapid methods are described for detg. naphthalene in gas. When gas is purified by an oil which dissolves the naphthalene the amt. of the latter can be detd. by measuring the naphthalene content of the satd. oil or by measuring the naphthalene content of the gas entering and leaving the purifier. When the detn. is

to be based on the oil a blank test is first made. The oil is fractionated and the fractions are plunged in a freezing mixt. Those in which a naphthalene ppt. is observed are centrifuged and the naphthalene vol. multiplied by its d. gives the wt. of naphthalene present in the original oil. To obtain the amt. absorbed from the gas, the amt. of gas passing through the purifier and the amt. of naphthalene absorbed by the oil should be known. The latter is obtained as in the blank test. The formula is $N = 100V/PQ$, where P = g. of naphthalene per 100 g. of satd. oil; Q = wt. in g. of pure oil used during 1 hour period V = vol. of gas in cu. m. passing through the app. per hour; N = naphthalene removed per cu. m. of gas. The efficacy of large scale purification can be tested by bubbling the gas slowly through 200 cc. of a pure oil free from naphthalene and distg. at 150-230°. The oil is then distd. and the naphthalene measured as before. The formula is $N = (2p/100) \times (1000/\text{liters of gas})$ or $20p/\text{liters}$ = naphthalene in g. per cu. m. The efficiency formula is $E = N'/N \times 100$. To obtain the naphthalene content from the gas directly it is passed through a picric acid soln. A part of the naphthalene forms a sol. picrate, the remainder remaining as free naphtha. Given the same conditions as to temp., which is generally 15°, the amt. of picrate dissolved is always the same and the free naphthalene can be measured by centrifuging the mixt., providing the same period and speed of rotation are always maintained. After the gas has passed through the picric acid the procedure is very rapid and can be completed within $1/2$ hr. The prepn. of the picric acid, method of operation and arrangement of the app. are described.

C. B. EDWARDS

Estimation of benzene in coke oven gas and scrubbing oil. L. SHUTTLEWORTH. *Gas World* 72, No. 1863 (Coking and By-products Sec.), 15(1920).—Methods are described for detg. benzene in coke-oven gas by absorbing it in a pure petroleum oil with a viscosity of 35-40 sec. at 60° F., and the benzene in the scrubbing oil by fractionation.

J. L. WILEY

Removing tar from coke oven gas. A. THAU. *Iron Trade Rev.* 66, 1535-8; 67, 34-7, 241-7, 511-6, 1331-5, 1607-10(1920); illus.—T. discusses the principles of tar extn. and describes in detail many standard methods and app. for tar removal by condensation, washing, friction and concussion.

J. L. WILEY

A study of the reactions of coal sulfur in the coking process. ALFRED R. POWELL. *J. Ind. Eng. Chem.* 12, 1069-77(1920).—Results of studies of successive changes in the compn. of S compds. of coal carbonized under carefully controlled conditions are given as follows: (1) Decompn. of FeS_2 to FeS , max. at 450°, complete at 600°; (2) reduction of sulfates to sulfides, complete at 500°; (3) formation of H_2S from part of org. S (25 to 33%) most active below 500°; (4) decompn. of small part of org. S to form volatile S compds. with C; (5) decompn. of a portion of the FeS yielding S which in turn combines with C.

H. L. OLIN

The desulfurizing action of hydrogen on coke. ALFRED R. POWELL. *J. Ind. Eng. Chem.* 12, 1077-81(1920).—An exptl. study of the effect of H_2 as a desulfurizing agent at temps. around 1000° shows marked reduction in S content of coke through its elimination as H_2S . By-product gases carrying only moderate amts. of H_2 are correspondingly less effective. Coke produced in commercial ovens contains less S than can be accounted for by the primary coking reactions due to flow of by-product gas through the heated mass.

H. L. OLIN

Fuel oil (Report of the work of the Egyptian Government laboratory, etc.) 13. Notes on the coal industry of northeastern France, Belgium, the Saar and Westphalia 1904-13 (CROOKS) 8. The manufacture of lime for chemical and metallurgical purposes (MEADE) 20.

Fuel. A. H. ECK. U. S. 1,357,627, Nov. 2. A fuel mixt. suitable for manuf.

of briquets is formed of coke breeze or slack 128, portland cement 9, $\text{MgO } \frac{1}{8}$, MgCl_2 and H_2O .

Carbonizing. VERZITT GES. Brit. 148,389, July 9, 1920. Peat, lignite, etc., are carbonized in a vertical and annular retort in which the upper part of the charge is heated to about 150° , and the lower part to $300\text{--}50^\circ$. The heating gases enter passages and pass upwards to and fro through pipes. Water vapor from the charge escapes through a pipe and the distn. gases are withdrawn by an exhauster. The solid product is cooled in an extension and discharged continuously through an outlet.

Obtaining liquid products from coal. F. BERGUS. Brit. 148,436, July 10, 1920. In obtaining liquid products from coal by hydrogenation under pressure, coal is used which contains not more than 85% of C referred to dry substance free from ash. In an example 5 kg. of coal having a C content of 74.48% on the above basis were mixed with 10 kg. tar oil and heated for 6 hrs. under a pressure of 100 atm. of H; 87% of the coal was converted into liquid products, as against 11% of a coal with a C content of 92.1% similarly treated.

Apparatus for preparing fuel briquets from straw or similar materials. S. J. FRANKLIN. U. S. 1,356,759, Oct. 26.

Direct recovery of ammonia from distillation gases. J. PIERRE. U. S. 1,356,885, Oct. 26. Retort gas is cooled to atm. temp., ammoniacal liquors resulting are distd. and the vapors from the distn. are treated in a rectifier to obtain hot NH_3 gas free from liquid particles. The NH_3 is mixed with the cooled retort gases and the mixt. is introduced into a closed saturator containing a soln. of $(\text{NH}_4)_2\text{SO}_4$ and H_2SO_4 .

Ammonium chloride. A. RIEDEL. Brit. 148,779, July 10, 1920. In working a by-product producer gas plant, the combined N in coal, peat, and bituminous shale is converted into NH_4Cl , which is extd. by washing the gases with H_2O .

Ammonium chloride. A. RIEDEL. Brit. 148,782, July 10, 1920. In the recovery of NH_4Cl during the distn., gasification, and combustion of fuel, Ca and Na chlorides, $(\text{NH}_4)_2\text{SO}_4$, urea, or a mixt. of CaO and NH_4Cl lye, are added to the charge. Acid gases produced are neutralized by NH_3 . The ash resulting from combustion contains a considerable quantity of the S from the fuel in the form of sulfide.

Ammonium chloride. A. RIEDEL. Brit. 148,783, July 10, 1920. In the recovery of N in the form of NH_4Cl during the combustion of fuel, a chloride is added to the charge together with H_2O or steam, and the NH_4Cl is extd. by washing the resulting gases.

Ammonium chloride. A. RIEDEL. Brit. 148,784, July 10, 1920. In the recovery of N in the form of NH_4Cl from fuel during its distn., gasification, and combustion, the charge is chlorinated and the gases are washed with oil at a temp. of $100\text{--}450^\circ$. Preferably, coal-tar oil is used.

Gas producers; ammonium chloride. A. RIEDEL. Brit. 148,780, July 10, 1920. In the manuf. of N compds. from coal, presumably in a gas producer, steam or H_2O is admitted to the zones having a temp. of $500\text{--}800^\circ$. The H_2O may be introduced in the form of hydrated Mg and Ca chlorides, thereby facilitating the formation of NH_4Cl .

Tar. C. FALK (representative of H. Falk). Brit. 148,785, July 10, 1920. In obtaining tar by the distn., more particularly of brown coal, the % of paraffin in the tar is increased by condensation when chlorides of the alkalis or alk. earths are added to the charge.

Sulfonic acids. SUDFELDT & Co. Brit. 148,763, July 10, 1920. Lignite tar oil is agitated with a small quantity of cold strong H_2SO_4 to remove polymerizable substances and then with a larger quantity of the acid at a higher temp. to effect sulfonation. The oil layer is agitated with hot dil. aq. soda lye, and after sepn. from the oil, the Na sulfonates are pptd. by addition of NaCl. A little H_2O is added to the H_2SO_4 layer to remove the excess H_2SO_4 , the remaining acid resins are dissolved in a large quantity of H_2O , filtered and a small amt. of NaCl is added. After sepn. the impure salts thus

pptd., the Na salts of the sulfonic acids are obtained by treatment of the filtrate with a larger quantity of NaCl, and are purified by further fractional pptn. or by treatment with alc. or permanganates.

Quenching coke with solutions of chlorides. A. RIEDEL. Ger. 319,550, Jan. 4, 1916. Back waters from the potash and soda industries are used for quenching coke, employing such concn. that the amt. of Cl absorbed is approx. chem. equiv. to the N content of the coke. The hot coke takes up about 35% of its wt. of lye, a portion of the solvent H₂O is evapd., and after complete cooling the coke contains about 8% H₂O. The presence of chloride in the coke is claimed to be necessary in obtaining N in the high furnace.

Coking. A. RIEDEL. Brit. 148,781, July 10, 1920. In the manuf. of coke, particularly for use in blast furnaces, fluxes such as alkali and alk.-earth chlorides are added during the process, or aq. solns. thereof or waste lyes may be used in quenching. The formation of NH₄Cl is mentioned.

Coking and carbonizing. I. SCHERK. Brit. 148,567, July 10, 1920. Low-grade fuel is distd. during its passage in a continuous stream through a vertical retort having a cooling zone at its lower end. A suitable construction is specified.

Coke oven. A. ROBERTS. U. S. 1,356,788, Oct. 26.

Coke-oven charging device. F. M. E. BLASS. U. S. 1,357,487, Nov. 2.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Prospecting for petroleum and gas in Italy. B. LOTTI. *Rass. min. mel. chim.* 53, 4-6(1920).—There are extensive indications of petroleum in the Appenines between Faluga and Piaceuga. The Eocene sandstones are the most probable oil-bearing formations, corresponding to the Carpathian sandstones. The inorg. origin of Italian petroleum accepted by most geologists suggests that deposits so far discovered are secondary, having migrated from great depths. The deep drilling necessary for exploration and development could be better handled by the state than by private enterprise.

J. S. LAIRD

Analysis of oil field water problems. A. W. AMBROSE. *Trans. Am. Inst. Min. Met. Eng.* 1920, (advance copy), 21 pp.—A detailed discussion, with sketches, of the various types of water encroachment encountered in oil wells. Suggestions are given for collecting field and production data upon which to base conclusions as to the location of waters, direction of flow, and proper remedial measures for each type. The use of dyes for tracing flow, and the application of chem. analysis to oil well waters are illustrated.

M. R. SCHMIDT

The iodine number of mineral oil products. W. R. RÖDERER. Berlin. *Z. angew. Chem.* 33, 1, 235-7(1920).—For the analysis of lignite producer tars and distillates, the Hübl-Waller and the Wijs methods should be used. The former gives a max. value after 24 hrs. when the wt. of I used is 5 times that of the sample of oil, and the latter after 16 hrs. when the wt. of I is 10 times that of the sample. For crude petroleum oils, which contain small %'s of unsatd. hydrocarbons, the wt. of I may be only 2 times that of the sample, but the time of reaction must be at least 16 hrs. The Wijs soln. gives a higher I value for Middle-Germany montan wax when the wt. of I is 10 times that of the sample and the time is made 16 hrs., than when the usual method is used. Still greater differences are observed with montan resin which is richer in unsaturated hydrocarbons. In general, the errors in ordinary analyses are greater, the greater the content of unsatd. hydrocarbons. The methods of fat and oil analysis cannot be applied without hesitation to mineral oils: in each case the influence of excess of I and of time must be detd.

W. F. FARACHER

New process of distillation for obtaining the most valuable fractions (viscous oils) from petroleum, petroleum residuum, as well as from oils which are immiscible with water, and from fats, resins, tars, etc. HEINRICH OFFERMANN. *Peine. Chem.-Ztg.* **44**, 773-4(1920).—Instead of superheated steam, O. uses wet steam with only sufficient pressure to overcome the oil column. Vacuum distn. may be combined with steam distn. using steam of this character. Explosions due to superheating of the minute droplets of H_2O in the steam have never occurred. The fractions obtained from reduced oils are much more viscous than when superheated steam ($250-400^\circ$) is used, as is shown in tables. Announcement of application for patents for using the process commercially has been made.

W. F. FARACHER

Gasoline cracking processes. FRED W. PADGETT. *Chem. Met. Eng.* **23**, 908-13 (1920); cf. *C. A.* **14**, 2707, 3316.—Classification and description are given of commercial methods for the production of gasoline by the pyrolysis of heavy-oil hydrocarbons, including the Burton, Greenstreet, Hall, Rittman, $AlCl_3$, Dubbs, Jenkins and Bacon processes. The paper concludes with a select list of patents covering the subject.

F. W. PADGETT

Pyrogenic cleavage of masut. OSSIAN ASCHAN. *Finska Vetenskaps societeten Förhandlingar* **61**, Afd. A, No. 7(1919); *Svensk Kem. Tidskrift* **31**, 193-201.—In the destructive distn. of "masut" (the residue after distn. of benzine and kerosine from Russian petroleum) chem. changes begin at about 250° and by 350° the cracking process sets in. The products formed between 350 and 1000° were reported in a previous contribution (cf. *C. A.* **13**, 3005). From this former study it is concluded that slow heating at $700-800^\circ$ is the most suitable for detg. the yields in butadiene, isoprene, benzene, etc. The gases evolved were washed in paraffin oil from which butadiene and isoprene were later recovered by heating this oil to 180° . The av. of several distns. gives the following: gases 43.65, liquid hydrocarbons 8.24, H_2O 7.13, and coke, tar, and loss 40.98%. The oil was fractionated as follows: I, $13-75^\circ$, 22%; II, $75-90^\circ$, 65%; III, $90-148^\circ$, 12%. Most of fraction I boiled at $33-40^\circ$. This contained isoprene and trimethylethylene. Dry $AlCl_3$ is the test used for isoprene. When the powdered $AlCl_3$ is added to the liquid at room temp. a yellow gelatinous ppt. is formed if isoprene is present. Benzene was identified in II and toluene in III. The gas consisted of C_mH_n 33%, CH_4 46%, H_2 15%, CO_2 2.5%, CO 1%, O_2 0.5%, N 2%. A considerable part of the C_mH_n consisted of isoprene, benzene, and toluene. The gas from petroleum plants shipped in iron cylinders contains a condensation oil which gives an analysis similar to that above. The gas from the Russian petroleum has almost as high a calorific value as acetylene (11170 cf. with 13840) and about twice as high as that from coal (5500). The condensation oil from the gas carries 2.54% isoprene, 24% benzene, 9% toluene, also some butadiene and dimethylbutadiene. A. R. R.

Investigation of the fundamentals of oil-shale retorting. M. J. GAVIN AND L. H. SHARP. *Bur. Mines, Reports of Investigations* No. 2141, July 1920, 4 pp.—The purpose of the investigation is to det. with scientific accuracy the effect of the various variable factors in retorting oil shale on the quality and quantity of the products produced, and the most favorable conditions for producing the highest yield of the best products. An exptl. retort has been designed and installed together with the necessary auxiliary equipment for controlling the process and recovering the products. The retort is a cast-iron, externally heated, horizontal, rotary, cylindrical retort set in a fire-brick furnace and insulated. Its capacity is 75 lbs. of shale at a charge. Gas is the heating medium. Shale from the DeBeque, Col., field is to be utilized. It yields on distn. about 42 gals. of oil per ton.

J. L. WILBY

Data on Colorado oil shale. M. J. GAVIN AND L. H. SHARP. *Bur. Mines, Reports of Investigations*, No. 2152, Aug. 1920, 8 pp.; *Gas Age* **46**, 219-20(1920).—Large-scale lab. retorting tests have been made to det. the conditions for producing the highest

yield of best quality products from Col. shales. (Cf. preceding abstr. and *C. A.* 14, 3526.)

J. L. WILEY

The prospects of utilizing bituminous shales and the results of the investigation of an especially rich shale. M. DOLCH. *Oesterr. Chem.-Ztg.* 23, 122-5, 130-1 (1920).—An address. A light yellow Austrian shale, having a sp. gr. of 0.8, yielded 31.2% shale oil by dry distn. and 42.4% when superheated steam was used. Extn. of the finely ground shale, even when previously treated with HCl, gave only 2-3% ext. (probably with the ordinary oil solvents.—W. F. F.). The analysis of the tar from the dry distn. by the method of Fischer, gave the following results: neutral oil, 27.1%; bases, 0.9%; creosote, 11.5%; slack wax, 9.9%; crude viscous oils, 50.0%; asphalt none. The m. p. of the paraffin was 38.5°. By decreasing the paraffin yield, the yield of lubricating oils should be increased. The distillate from the run with superheated steam had the following compn.: asphalts, none; neutral oils, 19.0%; creosote (alkali-sol. constituents), 37.9%; bases, 1.2%; slack wax, 21.6%; viscous oils, 21.2%. The sepn. of paraffin by acetone was difficult, so the results for wax are high, and therefore viscous oils low. Distn. of the primary distillate in order to have an analysis independent of the method of Fischer was accompanied by losses of 18-9%, due to cracking and consequent evolution of gas. The residue in the retorts had a C content of 13%. The creosote and paraffin constituents are most readily decomposed by heating. The decompn. of the former through loss of O in CO₂ may be regarded, to a certain extent, as a continuation of the natural process of formation of coal and solid fossil fuels. From 3 g. of crude shale oil, 3 cc. of CO₂ was obtained by heating to 300° in an atmosphere of N. Twenty-five cu. m. of gas having a heating value of 6360 cal. per cu. m., was obtained by the dry distn. of 100 kg. of shale. After the removal of the higher-mol.-wt. hydrocarbons (benzine), the gas has a heating value of 4000 cal. per cu. m. The benzine recovery is about 6% on the wt. of the shale. The residue in the retorts is in some cases useful for making building stone, cement, etc.

W. F. FARAGHER

Commercial retorting of oil shales. LOUIS SIMPSON. *Chem. Met. Eng.* 23, 789-91 (1920).—The Scotch retort is best for Scotch shales, but Scotch experience has proved detrimental instead of advantageous when operations had to be conducted under widely different conditions. Scotch shale is not, as has been claimed, the only true oil shale. True oil shales are of many kinds, and may differ as to the base of the mineral deposit, the base of the recovered oil, % of S and of fixed C, % of K recovered, % of (NH₄)₂SO₄ recovered, and value of spent shale. The location of the shale with reference to railroads and pipelines is important. The character of the deposit must also be considered, whether horizontal or vertical, whether much or little overburden is present, and whether shovel mining or deep mining is required. Each plant must be designed for individual conditions. The ideal plant handles 2000 tons daily. The labor costs for crushing, retorting, condensing, boiler and power house, and delivery, need not exceed 16 cents per ton, while the management, chem. control, and office costs need not exceed 8 cents per ton. Recovery of (NH₄)₂SO₄ may be <9 cents or >20 cents per ton. Repairs may be placed at 3 cents, loss on packages 2 cents, depreciation 10 cents, insurance and sundries 5 cents, making a total of 44 cents, plus the cost of (NH₄)₂SO₄ recovery, mining, and assembling. The latter may be <20 cents or >\$3.00, and the whole cost may be <\$1.00 or >\$3.00. There is at present a lack of experienced shale engineers competent to pass upon the problems involved. A large return may be expected from a properly designed 2000 ton plant. By-product recovery is important, as this may often pay for the cost of manuf., as well as for mining and retorting. M. R. S.

Acetic acid from wood and lignin. CARL G. SCHWALBE AND ERNST BECKER. *Z. angew. Chem.* 33, I, 225-6 (1920); cf. Pringsheim and Magnus, *C. A.* 14, 2013.—Polemical reply to P. and M. whose statement that "the greater part of the AcOH formed by cooking wood under pressure is derived from the lignin" is apparently not

substantiated by their data. The authors believe that not more than 50% (more probably about 33%) of the AcOH is derived from wood by cooking under pressure with NaOH. No new data are presented.

L. E. WISE

Filter for gasoline or other liquids (U. S. pat. 1,357,618) 1.

COMPAGNIE OCCIDENTALE DES PRODUITS DU PÉTROLE; De l'emploi des combustibles liquides. Paris: H. Desforges. 36 pp. 5 fr. For review see *Chimie & industrie* 4, 571(1920).

Desulfurizing petroleum oils. E. B. COBB. U. S. 1,357,224, Nov. 2. S is removed from petroleum oils by treating them with NaOH, Ca(OH)₂ or other alk. hydroxide and H₂S and heating. U. S. 1,357,225 relates to desulfurizing oils with an alk.-earth sulfide, *e. g.*, Ca sulfide.

Distilling hydrocarbon oils in vacuo. D. L. NEWTON. U. S. 1,356,878, Oct. 26. The method is especially adapted for the distn. of gasoline from an absorbent heavier oil of higher b. p. which has been used for treating natural gas. The mixt. is allowed to trickle down over a filling of broken rock fragments or other inert filling in a vacuum chamber at atm. temp. and the treatment is repeated with progressively increasing higher degrees of vacuum. In "topping" crude petroleum, a similar method may be used, with a filling of Fe shavings in the distn. chamber.

Separating paraffin from associated liquids. H. M. NICHOLS. U. S. 1,356,550, Oct. 26. Paraffin is sepd. from oil associated with it in a paraffin-bearing distillate by chilling the wax-bearing oil and then forcing it under pressure into a fabric tube capable of withstanding pressure so that the paraffin is collected on the inner surface of the tube and the oil passes to its exterior. The paraffin is removed from the tube by melting.

Revivifying fuller's earth or similar filtering agents. C. F. KENNEDY. U. S. 1,356,631, Oct. 26. Fuller's earth used for refining petroleum oils is restored for further use by agitating with a sulfonic soap soln., sepg. soakage oil and associated impurities, again agitating with soap soln., sepg. a further amt. of soakage oil and impurities, washing and drying. The fuller's earth also may be treated with naphtha and superheated steam as auxiliary purifying agents. Other filtering and purifying agents may be similarly revived, *e. g.*, bone black, decolorizing carbon or charcoal, kieselguhr or bauxite.

Fatty acids from mineral oils. G. TRICHNER. Brit. 148,353, July 9, 1920. Fatty acids are obtained by oxidizing, by means of air or O in the presence of a catalyst, mineral oils which have been previously freed from hydrocarbons which tend to form resinous and asphaltic substances; this purification may be effected by means of fuming H₂SO₄. It is preferred to use as parent materials oils containing at least 90% of hydrocarbons of the methane series.

Fatty acids from hydrocarbons. DEUTSCHE ERDÖL AKT.-GES. Brit. 148,892, July 10, 1920. Fatty acids are manufd. by treating aliphatic hydrocarbons in the form of a fine spray with O, air or ozone. A catalyst may or may not be present. As starting materials are mentioned petroleum or its distillates, tars from the distn. of wood, peat, shale, lignite, or coal, and products from such tars. A suitable app. is specified.

23—CELLULOSE AND PAPER

A. D. LITTLE

Determination of the viscosity of cellulose esters in volatile solvents and mixtures of these solvents and diluents. MAURICE DESCHIENS. *Rev. prod. chim.* 23, 503 (1920).—The viscosity of these solns. cannot be detd. by usual means because of the

rapid evapn. and consequent pptn. of the ester. Methods of Valenta and Cochius are applicable but the lab. of the Allied Aviation Service adopted a process using the Ostwald viscometer. Glycerol of 30° B \acute{e} . at 15° was taken as a standard. The soln. to be tested is made by completely dissolving 6 g. of cellulose acetate dried at 105° in 100 cc. of acetone. Various com. acetates so tested had viscosities between 10.5 and 42 compared with 100 for glycerol. Those between 10 and 30 are preferred for use on aircraft. Results of numerous tests in Aviation Service lab. agree with the conclusion of Worden (C. A. 14, 1038) that of esters similarly prepd. those of higher viscosity give films of greater tenacity and elasticity.

S. D. KIRKPATRICK

Results of laboratory tests by "Cellulose et Papiers" in connection with pulp and paper making. A. L \acute{E} CHATELIER. *Chimie & industrie* 4, 529-42(1920).—Preliminary tests made in June–Nov. 1916 showed the advisability of using material which could be treated without pressure rather than wood. Over 10,000 tests have since been made on various materials from different parts of France, Northern Africa and the African coast, the total expenditure (including rent and overhead) being less than Frs. 60,000 a yr. The article briefly gives the conclusions arrived at as a result of tests in cooking, equipment, practical applications, cooking liquors, various raw materials (leaves, flax from the seed, flax waste, hemp waste, jute waste, etc., peat, palms, typhas, esparto, osier, etc.), mixts. of pulp, elec. insulators from pulp, waterproofing of chem. pulps, oils, fats and waxes, plastic pulps, cellulose, machines.

A. P.-C.

Bamboo pulp. *World's Paper Trade Rev.; Papeterie* 42, 380-1(1920).—A brief discussion of the possibilities of relieving the present paper shortage by means of bamboo pulp. As it is a grass, bamboo has many characteristics in common with esparto. It can be used for all kinds of papers. Expts. by the Indian govt. have shown that the consumption of bleach may be reduced to 10% of bleaching powder, calcd. on the wt. of the unbleached pulp. Though bamboo pulp cannot entirely replace strong sulfite pulp it can advantageously be substituted for about 50% of the sulfite; and if ground wood remains at its present high price bamboo pulp can be produced cheaply enough to replace it entirely.

A. P.-C.

The analysis of sulfite liquors during cooking. A. CHAMBOVET. *Papeterie* 42, 366-70, 914-8, 966-70(1920).—In the sulfite process, as cooking proceeds, there are formed certain amts. of AcOH and of HCO $_2$ H, the former from the COCH $_2$ group of the lignin and the latter by the decoppn. of hexoses and also because it is present as such in wood. Hence, an acidimetric titration of the liquor does not give a measure of the free SO $_2$, but of the sum of the free SO $_2$, of H $_2$ SO $_4$, and of the various org. acids formed. These may be detd. by a series of titrations after shaking the liquor with an immiscible liquid in which one or more of the acids is sol. Case I: Mixt. of 2 acids. Suppose a vol. Q of sulfite liquor, containing a mixt. of 2 acids which would require m cc. of standar alkali, be shaken with a vol. Q' of an immiscible solvent (e. g., Et $_2$ O), and that the layer^s on sepg. should have vols. A and E , resp. Let a and e be the no. of cc. of alkali required to neutralize the acidity of 10 cc. of the aq. and ethereal layers, resp., K and K' the partition coeffs. of the 1st and 2nd acids between the 2 solvents, x and y the total no. of cc. of standard alkali required to neutralize the amt. of the 1st and of the 2nd acids, resp., contained in vol. Q of the original liquor. Then $x = ((a/10) - (mK'/AK' + E)) \div ([K/(AK + E)] - [K'/(AK' + E)])$; $y = ((mK/[AK + E]) - (a/10)) \div ([K/(AK + E)] - [K'/(AK' + E)])$. Case II: Mixt. of H $_2$ SO $_4$, H $_2$ SO $_3$, HCO $_2$ H, AcOH. Let Q , Q' , m , A , E , e , have the same meanings as above. Let x , y , s , t be the no. of cc. of standard alkali required to neutralize the AcOH, HCO $_2$ H, H $_2$ SO $_4$, H $_2$ SO $_3$, resp., contained in vol. Q of the original liquor; K and K' the partition coeffs. of AcOH and HCO $_2$ H, resp., between the 2 solvents. SO $_2$ is detd. in a sep. portion by pptg. as BaSO $_3$; SO $_3$ is oxidized to SO $_4$ by means of I and the total SO $_2$ pptd. and detd. as BaSO $_4$; and from these results s and t are calcd. Then, $x + y + s + t = m$, $x + y = m -$

$(z + t) = m'$, $x = m' - y$, $y = (AK' + E)[e(AK + E) - 10 m'] / 10 A (K - K')$.

A. P.-C.

Automatic cooking control for chemical pulp. C. H. ALLEN. *Chem. Met. Eng.* 23, 1015-6(1920).—See C. A. 14, 3319.

E. J. C.

Reclaiming of acid. O. L. BERGER. *Paper Industry* 2, 1213, 1252-4(1920).—A discussion of the operation of the counter-current cooler and of recovery towers in reclaiming SO_2 .

H. H. HARRISON

Testing of "kraft" pulp for strength. K. G. WILÉN. *Pulp Paper Mag. Can.* 18, 1181-84(1920).—Twenty-five g. of air-dry pulp are thoroughly broken up by forcing the pulp through a screen with $1\frac{1}{16}$ " round holes by means of a jet of water. The screened pulp is then collected on a specially designed sheet machine and placed in a tared weighing cylinder. The contents of the cylinder are made up to 3 kg. with water and transferred to the ball mill jar. The vol. of the jar is 4.5 l. and it contains 2,500 g. of pebbles of such size that there are 250 pebbles in each jar. The pulp is beaten for one hr. in the ball mill at a speed of 66 r. p. m. The beaten pulp is washed out of the jar and made up to 10 l. in a vat from which 3 measures of 450 cc. each are placed in a pail and made up to approx. 5 l. with water. After thorough stirring the contents of the pail are poured on to the sheet machine which is made of a perforated brass plate backed by a 14-mesh and a 60-mesh machine wire. A quickly opening gate valve is used for draining the water from the machine. The sheet made is couched, then pressed in a letter press for 15 secs., after which it is placed in a drying oven and dried at $180^\circ F$. When thoroughly dry the sheets are taken out and allowed to re-absorb the hygroscopic moisture for 1 hr. They are then cut to $6" \times 6"$ and weighed to the nearest 0.05 of a g. The wt. of the sheets is calcd. to lbs. per ream of 480 sheets $24" \times 36"$ and tested on the Mullen tester in the 4 corners and in the center. The av. Mullen test multiplied by 100 and divided by the ream wt. is the expression for the strength of the pulp. The data of the exptl. work done in developing this method is also given.

H. H. HARRISON

Lignified and sub-lignified plants suitable for paper making. CH. GROUND. *Papier* 23, 217-21(1920).—A suggestion that various French plants be utilized for paper making and other purposes. *Osier* peel is a rather strong fibrous material and contains an appreciable amt. of tannin and of *salicin* (a glucoside used as a quinine substitute) which is easily extd. with boiling water. *Heather, broom* and *gorse* grow very abundantly in France and are suitable for papermaking. *Gorse* contains 0.8% of a diuretic resin, and also a poisonous alkaloid, *cytisine*, which is present in small amts. in the green portions of the plant and up to 2.5% in the seed. *Spanish broom* (*Spartium jonceum*) is used in certain parts of Italy for the manuf. of very light hand-made textiles, cordages, and papers. If the fiber is prepd. mechanically it is neither long enough nor strong enough to be used as a textile but can be used for paper making.

A. P.-C.

The manufacture of pulp by the electrolysis of salt solutions. RAYMOND FOURNIER. *Papier* 23, 225-6(1920).—The manuf. of pulp by the electrolysis of a NaCl soln. is by no means new. It is mentioned by H. de Montessus de Ballore in his book on the manuf. of paper pulp (published 1913) and was patented by Kellner. The process did not give good results, for there are certain difficulties which have not yet been overcome, the chief of which is as follows: When operating in the cold, the action of the Cl is satisfactory, but the NaOH is not sufficiently active; when operating at a high temp., with or without pressure, the action of the NaOH is satisfactory, but that of the Cl too energetic.

A. P.-C.

Book paper from southern pines and gums. SIDNEY D. WELLS. *Paper Trade J.* 71, No. 22, 34-42(1920).—Under carefully regulated conditions, loblolly pine and red gum can be reduced by the sulfate process, with high recovery of soda, to pulps which bleach easily with reasonable amts. of bleach and which are suitable for the

manuf. of book paper. Max. yields are 40%; a bleaching operation involving two steps is used.
H. H. HARRISON

Drying in the papermaking industry. *Papeterie* 42, 686-9, 726-39, 777-81, 822-6, 870-7, 921-2(1920).—A study is reported of drying in the papermaking industry including air drying and drying by direct contact with a heating surface, calcns. relative to both classes of drying, details of construction of the drying cylinders, the effect of drying on the finish of the paper, and the defects due to faulty drying, with a brief description of various types of moisteners.
A. P.-C.

The quest for wood substitutes for the paper industry. LOUIS BARBILLION. Grenoble, France. *Papeterie* 42, 929-30(1920).—Though a considerable amt. of research along these lines has been done in France and considerable money spent, the results obtained have not been commensurate with the effort, owing to lack of proper organization and coöperation. A plea is made that work of such a nature be centralized at the French School of Papermaking, Grenoble, as it is already well organized and equipped and has the required personnel.
A.P.-C.

Ostwald's color theory in the dyeing of paper. ANON. *Svensk Pappers-Tidning*, 23, 209(1920).—A résumé of the color theory of W. Ostwald and its application to the coloring of paper pulp.
W. SEGERBLOM

Notes on paper testing. J. STRACHAN. *Paper-Maker and Brit. Paper Trade J.* 60, 608F-G(1920).—A list of precautions to be taken when estg. the fibrous constituents of paper, measuring the bursting strength, and measuring the thickness of paper.
H. H. HARRISON

The testing of wood pulps. G. H. GEMMELL. *Paper-Maker and Brit. Paper Trade J.* 60, 608G-J(1920).—G. gives data demonstrating the importance of sampling only intact and undamaged bales of wood pulp if trustworthy results as to moisture content of a shipment are to be obtained. If bales were shipped uniform in wt. and moisture, controversy between pulp maker and paper mill would be avoided.
H. H. HARRISON

Technical education in paper making. J. E. AITKEN. *Paper-Maker and Brit. Paper Trade J.* 60, 608C-F(1920).—A plea for the technical education of the employees in paper mills.
H. H. HARRISON

Strainers for paper-making machines. A. McIVOR. *Paper-Maker and Brit. Paper Trade J.* 60, 608J-L(1920).—A history of the development of paper-mill screens.
H. H. HARRISON

Cellulose acetate mixture for films, etc. G. W. MILES. U. S. 1,357,335, Nov. 2. A compn. suitable for coatings, films or molded articles is formed of cellulose acetate mixed with acids derived from coconut oil.

Purifying cellulose esters. S. E. SHEPPARD. U. S. 1,357,733, Nov. 2. Unfixed acid and acid-reacting substances are removed from cellulose nitrates or other cellulose esters having a large surface in proportion to their mass, by treatment with a concd. soln. of Na_2SO_4 followed by washing with H_2O .

Banana-tree fibers. H. R. MOODY and L. H. FRIEDBURG. U. S. 1,357,580, Nov. 2. A fiber suitable for use as a *paper stock* is obtained by electrolyzing raw fiber from the banana tree in sea water to effect disintegration and then subjecting the material to further disintegrating and bleaching action.

Greaseproof cardboard. A. J. CAVANAUGH, JR. U. S. 1,357,844, Nov. 2. Cardboard is rendered impervious to grease by treatment with a mixt. in paste form made up of Na silicate 11 lbs., mica 4 oz., glycerol 10 oz., powdered dextrin 3 oz., and sufficient prepd. chalk to thicken the mixt.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Radiation in explosions of hydrogen and air. W. T. DAVID. Cambridge Univ. *Proc. Roy. Soc. (London)* 98A, 183-98(1920); cf. *C. A.* 14, 689, 893.—The first part consists of expts. on radiation emitted during explosion and subsequent cooling of inflammable mixts. of H and air in a closed vessel. The second part deals with the transparency of the hot gaseous mixts. after explosion. Radiation phenomena are, in general, similar to those previously observed in coal gas mixts. The most noticeable difference is that the max. rate of emission was not found with H to be during the explosion, as was the case in the coal gas expts. The hot gaseous mixts. after explosion were found to be quite transparent to radiations of the same wave length as they emit.

J. T. R. ANDREWS

Use of air as an explosive. E. AMPT. *Russ. min. met. chim.* 53, 9-12(1920).—The use as an explosive of a cartridge of carbonaceous material satd. with liquid air or better O has been greatly extended during the war. Early difficulties have been largely overcome by the development of metallic double-walled containers for the liquid oxygen, and special methods of firing. Marked economy over the use of ordinary explosives has been shown, and there is no danger of explosion during transport, as the cartridge is immersed in the liquid oxygen just before being used. Cf. *C. A.* 14, 2264, 3795.

J. S. LAIRD

Industrial poisoning in the manufacture of explosives (LEGGE) 13. A method for measuring low vapor pressures, with its application to trinitrotoluene (MENZIES) 2. Alcohol as a motor fuel (DIXON) 21.

Ammonium perchlorate explosives. R. M. COOK and E. W. HARRIS. U. S. 1,357,764, Nov. 2. Explosives suitable for use in blasting are formed of NH_4ClO_4 (at least 50% of which must pass a 60-mesh screen; coated with 0.1-1.5% of oil or wax) 15-65%, MnO_2 3-15%, NaNO_3 (coated with 0.1-1.5% of oil or wax) 5-50%, liquid nitroaromatic hydrocarbons such as "liquid dinitrotoluene" 0.5-5.0%, TNT 15-30%, S 0-7%, and chalk 0-3%. The proportions are so adjusted within these limits that the "oxygen balance" is between minus 4% and plus 6%.

Propellant explosive. C. I. B. HENNING. U. S. 1,357,865, Nov. 2. Fouling of guns is lessened by the addition of about 1-5% of oxide or carbonate of Sn or Pb to explosives such as nitrocellulose powders.

Explosives. SPRENGLUFT-GES. Brit. 148,534, July 10, 1920. Fuses for detonating liquid-air blasting cartridges are made by mixing PbN_3 , fulminate of Hg, and trinitrotoluene with the absorbent for the liquid air. The carboniferous absorbent may also be blended with Ca, Cl, P, Si, Ba, Mg, Zn, Sn, Cu, Al, Fe, Mn, and their compds.

Explosives. SPRENGLUFT-GES. Brit. 148,537, July 10, 1920. As absorbent for liquid air for blasting, peat is used alone or mixed with other ingredients and to the absorbent powdered cork or bark is added in small quantities, namely from 3 to 6%. Instead of peat, peat coke or coke obtained from similar light materials may be used. Hydrocarbons may be added to the absorbent. Soot and salt are mentioned as ingredients of absorbents.

Blasting cartridges. SPRENGLUFT-GES. Brit. 148,535, July 10, 1920. Detonators for liquid-air and like cartridges are impregnated with liquid air before insertion in the borehole, preferably with an excess of liquid air to provide for evapn. The detonator compn. is enclosed in a perforated tube of strong material such as Fe to increase its power; and this also renders it ineffective after a certain loss of liquid air by evapn.

during a given time. An ordinary igniting fuse may be combined with the detonator impregnated with liquid air.

Blasting cartridges. SPRENGLUFT-GES. Brit. 148,538, July 10, 1920. Cartridges impregnated with liquid air or liquefied gases have an envelope or casing of pervious paper such as filter or blotting paper or paper provided with perforations or pervious patches, and the cartridge is cooled before impregnation with the liquid air.

Blasting cartridges. SPRENGLUFT-GES. Brit. 148,539, July 10, 1920. Absorbents for liquefied gases for blasting cartridges are made by molding or binding the absorbents in a solid whole or into a number of solid units. Among absorbents mentioned are tissues, vegetable fibers, and felt. For safety, there may be added H_2O , salt, sugar or soap. The porosity required for absorption may be obtained by fermentation.

Blasting charges. SPRENGLUFT-GES. Brit. 148,540, July 10, 1920. In blasting charges comprizing C carriers impregnated with liquid air or O, means are provided whereby an excess of O is absorbed to provide for evapn. before the shot is fired. The C carrier may itself absorb the excess, or a sep. space or absorbent is provided in the charge or in the tamping for holding this excess. Layers of absorbents capable of taking up different quantities of liquid O may be used; and the amt. of O absorbed may be regulated according to the effect desired on explosion. O-containing substances such as chlorates and gas-producing substances such as oxalates and fulminates may also be added to the charge. To prevent the formation of noxious gases, an inert salt or a substance able to produce an alk. reaction may be added. The tamping preferably contains materials for absorbing the gases evapn. from the charge, or free spaces or interstices to relieve the pressure due to that evapn.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The evolution of the oil varnish industry. C. COFFIGNIER. *Chimie & industrie* 4, 317-23(1920).—A brief review is given of the history of and recent developments in oil varnish manuf. Terpinol and amyl alc. are unsatisfactory as resin solvents. To avoid the usual loss from melting resins, 3 parts naphthalene (or preferably two parts naphthalene and 1 part copal oil) are heated with 1 part resin in an autoclave at 270-300° and 4-6 atm. for 1.5-2.5 hrs. The naphthalene is distd. off and linseed oil incorporated under pressure for the manuf. of an excellent varnish. The resin treated as described is sol. in $CHCl_3$, aniline, benzaldehyde and amyl acetate. The incorporation of copal oil, and subsequent esterification of the free acid with glycerol and benzyl alc. produces a neutral, light-colored and brilliant varnish. C. B. EDWARDS

Recommended specification for composite thinner for thinning semi-paste paints when the use of straight linseed oil is not justified. P. H. WALKER, *et al.* Bur. Standards *Circ.* No. 102, 5 pp. Oct. 1920.—Prepd. and recommended by U. S. Interdepartmental Committee on Paint Spec. Standardization. The composite thinner contg. in one, liq. drying oil, drier, and volatile thinner, often offered under the trade names of "japan oil," "paint oil," etc., shall be clear and free from sediment; no darker in color than 6 g. $K_2Cr_2O_7$ in 100 cc. conc. H_2SO_4 ; inoffensive in odor; a mixt. in any proportion with raw linseed oil shall remain clear for 18 hrs.; shall dry hard in not more than 6 hrs., and a mixt. with an equal vol. of raw linseed oil shall dry hard in not more than 8 hrs.; film on glass after baking for 6 hrs. at 105-10° shall be tough, glossy, and elastic; non-volatile matter, not less than 50% by wt.; acid no. not more than 12, calcd. to basis on non-volatile matter. Detailed directions for sampling and lab. examn. are given.

F. A. WERTZ

Recommended specification for liquid paint drier. P. H. WALKER, *et al.* Bur. Standards, *Circ.* No. 105, 4 pp., Oct. 1920.—Prepd. and recommended by U. S. Inter-

departmental Committee on Paint Spec. Standardization. The drier may be either an oil or a japan drier composed of Pb, Mn, or Co, or mixts. of these combined with suitable fatty oil with or without resins, and mineral spirits or turpentine or a mixt. of these solvents. It shall be free from sediment and suspended matter, leave an elastic film when baked on metal for 2 hrs. at 100°; flash p. not less than 30°; shall mix with raw linseed oil 1:19 by vol., without curdling, and the mixt. shall dry in not more than 18 hrs. The color of the mixt. of 1 vol. drier to 8 of raw linseed oil shall be no darker than 6 g. $K_2Cr_2O_7$ in 100 cc. conc. H_2SO_4 . Detailed directions for sampling and testing are given.

F. A. WERTZ

Recommended specification for spar varnish. P. H. WALKER, *et al.* Bur. Standards, *Circ.* No. 103, 5 pp., Oct. 1920.—Prepd. and recommended by U. S. Interdepartmental Committee on Paint Spec. Standardization. The varnish shall be the best long oil varnish; clear and transparent; not darker in color than 6 g. $K_2Cr_2O_7$ in 100 cc. conc. H_2SO_4 ; flash p. not below 30°; non-volatile matter not less than 40%; set to touch in not more than 5 hrs., and dry hard and tough in not more than 24 hrs.; film on metal must stand rapid bending over a 3 mm. rod; must brush, flow, cover, and level properly; resist cold H_2O for 18 hrs. and boiling H_2O for 20 min. without whitening; must show a durability equal to a mutually agreed standard. Details of sampling and testing are given. (Cf. C. A. 12, 2450).

F. A. WERTZ

Recommended specification for asphalt varnish. P. H. WALKER, *et al.* Bur. Standards, *Circ.* No. 104, 6 pp., Oct. 1920.—Prepd. and recommended by U. S. Interdepartmental Committee on Paint Spec. Standardization. The varnish shall be composed of high-grade asphalt fluxed with properly treated drying oil and thinned with volatile solvent; shall be smooth and homogeneous, free from livering or stringiness; jet black in color; flash p. not below 30°; mix freely with an equal vol. of raw linseed oil; not more than 1% insol. in CS_2 ; not less than 40% non-volatile matter; not less than 20% fatty matter; rosin absent; set to touch within 5 hrs., and dry hard and tough in 24 hrs.; film on metal must withstand rapid bending over a 3 mm. rod; must brush, flow, cover, and level properly; withstand cold H_2O for 18 hrs., lubricating oil for 6 hrs., and the following mineral acids for 6 hrs.: H_2SO_4 (sp. gr. 1.3), HNO_3 (sp. gr. 1.22), HCl (sp. gr. 1.09). Detailed directions for sampling and testing are given.

F. A. WERTZ

The drying of oils. CH. COFFIGNIER. *Rev. chim. ind.* 28, 199-204 (1919).—An historical account of the prepn. of drying oils is interspersed with references. The following industrial formulas for preparing bodied oils are given: Ordinary bodied oil—linseed oil 100 kg., litharge 6 kg. Heat the oil to 150°, add the litharge little by little, stir well and allow the temp. to rise to 230-240°. Thin bodied oil—linseed oil 100 kg., litharge 11 kg., umber 0.750 kg. Heat the oil to 150°, add the litharge, let the temp. rise to 250° and then add the umber; carry the temp. to 270° and maintain until the desired consistency is reached. Pale bodied oil—linseed oil 100 kg., red lead 1.5 kg., umber 1.5 kg., and lime 1.5 kg. Heat the oil to 170°, add the red lead, and then the umber little by little, at the same time allowing the temp. to rise to 220-230°. Draw from the fire and add the lime in small portions. The following results of comparative tests of raw and crude oils are given: Raw oil— d_{15} 0.932, I no. 162.9. Oil bodied with Pb and Mn— d_{15} 0.942, I no. 171. Oil bodies with Pb and Mn— d_{15} 0.959, I no. 169.7. The various characteristics of polymerized oils is shown by the following data. Raw linseed oil— d_{15} 0.9321, sapon. equiv. 194.8, I no. 169. Thin varnish— d_{15} 0.9661, sapon. equiv. 196.9, I no. 100. Medium varnish— d_{15} 0.9721, sapon. equiv. 197.5, I no. 91.6. Heavy varnish— d_{15} 0.9741, sapon. equiv. 190.9, I no. 86.7. Extra heavy varnish— d_{15} = 0.9780, sapon. no. 188.9, I no. 83.5. Results are also given for other polymerized drying oils, as abrasin, the oil of carthamus and kola nut oil. The presence of metallic oxides in com. bodied oils gives too high an I no. This can be remedied by substituting

an acid treatment. Adulteration of boiled linseed oil with resin can be detected by measuring the index of refraction. Av. values for the pure oil are: Raw linseed 80.5 to 82.5 (n), boiled linseed 80.5 to 84.5. The addition of 5%, 10% and 20% of resin gives, resp., 88.5, 92.5, 100 as values for n . For an n between 84.5 and 85.5 the oil is sapon. and water added. A cloudiness indicates a small amt. of resin or resinsates. If the addition of water after sapon. of an oil of higher n gives a very milky appearance, then it indicates the presence of a mineral oil or resin oil, according to whether the polarimeter deviates to the left or right. The addition of resin oil lowers the I no. With 20% it is not more than 45.6.

C. B. EDWARDS

The polymerization of fatty oils. J. MARCUSSEN. *Z. angew. Chem.* 33, I, 237-41, 234-5 (1920).—Blowing fatty oils causes a decrease in I no. and an increase in sp. gr. due to polymerization and oxidation. The detn. of the mol. wt. tends to disprove this idea, for the mol. wts. detd. were as high as those of the original oils in some cases and lower in other cases; this latter is explained by the decompn. of high molecular fatty acids by O. Blown oils contain water-sol. and volatile fatty acids. A blown rape oil gave a mol. wt. of 360 and contained 14% of dark hydroxy acids sepd. by petroleum ether. When the volatile acids were distd. from the petroleum ether-sol. acids the mol. wt. rose to 412. As the mol. wt. of the fatty acids containing the most C is 338 it is evident that polymerization has taken place. To det. whether chemicals produce polymerization 10 g. of linseed oil were dissolved in 40 cc. benzene and 3 g. $AlCl_3$ added and the soln. was heated, treated with HCl and shaken out with ether. A viscous oil of I no. 120, sapon. no. 185 and acid no. 15.6 resulted. The fatty acids had a mol. wt. of 360. Other oils were treated in a similar manner and in each case the I no. fell but not to such an extent as to indicate pronounced polymerization. Chinese wood oil is readily acted upon by $AlCl_3$ and $FeCl_3$. The fat from the yeast *Endomycetes vernalis* when the yeast has been dried with salt shows polymerization and likewise the sterol present.

E. SCHERUBEL

Spontaneous decomposition of linoxyn. F. FRITZ. Berlin-Wilmersdorf. *Chem. Umschau.* 27, 173-4 (1920).—Solid linoxyn, kept in glass jars, frequently softens to a thick liquid; linoleum cement, consisting of 80 linoxyn, 15 rosin and 5 kauri copal, also shows this phenomenon, while finished rolled linoleum does not. Linoxyn, when rolled into thin sheets exposed to further oxidation by sunlight and air even for yrs. does not soften but hardens, while sheet linoxyn, when piled up under a glass jar—without ventilation—will soften after several months, with a thick liquid appearing where the sheets touch; this softening takes place even under water. F. thinks a molecular rearrangement takes place during which the molecularly added O splits off where it took the place of the double C bond. The above-mentioned softening occurred at a Triest factory where the oxidation building was closed and left unheated and unventilated from March 1915 until August 1916. In March 1915 the linoxyn had already started to harden; when the building was opened in August 1916, the cloths were soft and sticky, but the air on the run ways caused no inconvenience in breathing. When the ventilation was started up again, further oxidation of the linoxyn set in. A few of the cloths were removed before starting ventilation and were hung in a dimly lighted closed room. After a few weeks the whole of the linoxyn had run off from these cloths, and it seems therefore that the chief factor which prevents continued oxidation and starts decompn. is the atmospheric moisture. This is confirmed by the previous observation that hot, close "scirocco" weather with much moisture retarded oxidation in factory practice, while cold, dry "bora" winds caused surprisingly rapid drying. In the same factory a quantity of granulated finished linoxyn mixt., ready for linoleum, had lain in an iron box from July 1914 to February 1920 in a dim, cool, unventilated place. On opening the box the upper layer was normal and dry and only at the bottom of the box was the mass sticky, soft and could be kneaded.

P. ESCHER

Industrial poisoning in the manufacture of airplanes (LÖGGE) 13.

Removing paint from painted surfaces. J. P. SCHAEFER. U. S. 1,357,730, Nov. 2. Paint is removed from automobile bodies or similar painted surfaces by application of a NaOH soln. by means of a hose and nozzle or similar device. The soln. is preferably applied hot and as the operation proceeds the soln. is gradually dild.

Japan. H. CHISLET. U. S. 1,357,688, Nov. 2. A water japan suitable for use as a dipping or painting compn. is formed of a japan base emulsified with an aq. soln. of NH_3 and glue, starch, agar or a sol. silicate.

Zinc sulfide and oxide; pigments. A. HELBRONNER. Brit. 148,351, July 9, 1920. Pure ZnS is obtained by calcining in a closed vessel a mixt. of ZnSO_4 , H_2SO_4 , and sawdust or other carbonaceous material and optionally an alkali or alk.-earth sulfate such as MgSO_4 . The product is washed with H_2O containing enough H_2SO_4 to remove the MgO and ZnO, and BaCl_2 may be added to the washing H_2O to ppt. BaSO_4 with the ZnS. Alternatively pure ZnO may be obtained by replacing the ZnSO_4 in the original mixt. by ZnO, or by calcining the mixt. in an oxidizing atm., the rest of the process being as described above.

Composition for use in painting. M. E. B. ERLINGER. U. S. 1,356,913, Oct. 26. A mixt. formed of "Manders' filler" 2, white lead 2, rubbing varnish 1 and japan 1 part by vol. is used for a non-cracking coating.

Acetylcellulose varnish. A. EICHENGRÜN. U. S. 1,357,447, Nov. 2. An acetylcellulose soln. is formed without heating by use of 2 solvents, one of which acts alone as a solvent when cold and the other of which acts alone as a solvent only when heated. A mixt. of guaiacol, alc., C_6H_6 , acetone and H_2O may be used as the solvent. It avoids blistering during drying.

Synthetic resins, etc. H. BUCHERER. Brit. 148,366, July 9, 1920. Addition to 148,139 (C. A. 15, 183). Derivs. of the resinous condensation products from phenols and HCHO are obtained by partially or completely closing the hydroxyl groups thereof by radicals possessing "certain valuable properties and activities;" e. g., in place of introducing acetyl, benzoyl, etc., radicals as described in the principal patent, the radicals of valeric, bromovaleric, cinnamic, salicylic, mandelic, etc., acids, which have medicinal properties, may be introduced. Or the resins may be condensed with amines, phenols, aminophenols, etc., or substances having coloring, tanning, medicinal, etc., properties, through the agency of compds. which introduce a linking radical, the products obtained being of the type $a-c-b$, where a indicates the residue of the parent resin, b the amine or phenol residue, while c represents the linking radical, which may be $-\text{CO}-$, $-\text{COCO}-$, $-\text{CH}_2\text{CO}-$, $-\text{CH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}_2-$, $-\text{COC}_6\text{H}_4\text{CO}-$, $-\text{CS}-$, etc. According to an example, the resin from cresol and HCHO is treated with phenol and phosgene in alk. soln.; the resulting resin is difficultly sol. in alc.; in place of phenol, a mixt. of the three cresols, or a mixt. of the two naphthols, may be used; in the last case the resulting resin is difficultly sol. in most organic solvents. In the above processes and in that described in the principal patent, other aldehydes may replace HCHO.

Phenol-aldehyde condensation products. Soc. CORALEX. Brit. 148,264, Sept. 30, 1919. Purified phenolic resins are obtained from the crude condensation products of phenols and aldehydes by successive washing with hot H_2O , dil. mineral acid, and cold H_2O . The products are converted into insol. products by heating to 100° , or they may be dissolved in alc., acetone, amyl acetate, etc., with or without addition of mineral colors to form varnishes or lacquers; or by adding dyestuffs they give preps. suitable for finishing fabrics. The purified phenolic resins combine with bases, such as CaO, baryta, Fe_2O_3 , etc., or with polyvalent alcs. such as glycerol, or with mixts. of bases and glycerol; the resulting products are hardened by heating to 100° . Examples are given of mixts. of the purified resin with $\text{Al}(\text{OH})_3$ or with glycerol and $\text{Fe}(\text{OH})_3$.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

The hydrogenation of oils. M. FRÉJACQUE. *Chimie & industrie* 4, 443-56(1920).—A review of the origin and development of hydrogenation, the purpose for which it is carried out, the industrial process, and the various uses to which hardened oils are put, together with a bibliography including references to both patents. A. P.-C.

The use of silicates in the clarification of oils and fats. H. SMIT ADDENS. *Olief en Vetten* 5, 191-2(1920).—The use of various earths for oil clarification is reviewed.

NATHAN VAN PATTEN

Proposed method for determining the quality of cottonseed oil obtainable from a lot of seed. F. B. PORTER. *Cotton Oil Press* 4, No. 7, 49(1920).—A method for quickly determining the refining loss, color and flavor of the oil obtainable from a given lot of cottonseed. The methods depending upon the F. F. A. in the gasoline ext. or the percentage of off-colored seed are both unsatisfactory. A miniature oil-milling equipment, consisting of a huller, stand of rolls, cooker, cake former and hydraulic press is described and pictured. With this outfit the oil can be obtained from 25 lbs. of seed, and tested by the usual methods.

H. S. BAILEY

The analysis of sulfonated oils. ANON. *J. Am. Leather Chem. Assoc.* 15, 595-9 (1920).—Discussion following the 1920 Committee Report. The chairman recommends that the analysis of sulfonated oils contain the following details: (1) Moisture, ash, unsaponifiable, combined SO_3 , NH_3 and total fatty matter. (2) Total alkali and free fatty acids (in mg. of KOH per g.) and neutral fat (optional). Procedures for each detn. are recommended. Criticisms and comments are invited. The committee will continue its work if necessary. Otherwise Hart's proposal for detg. total fat by difference will be included in the recommendations submitted for adoption as official methods.

C. F. JAMESON

Determining the color of soy-bean oil. R. V. ELLISON. *Cotton Oil Press* 4, No. 6, 49-50(Oct. 1920).—In reading the color of soy-bean oil it is often impossible to obtain a satisfactory color match with red and yellow Lovibond glasses unless some blue or neutral tint is added. The E. K. colorimeter (*C. A.* 14, 3329) in this respect is an improvement over the present method in that it introduces some neutral tint. With the present Wesson-Peep tintometer and only red and yellow Lovibond glasses if one or more strips of white paper be added to the glass side to equalize the intensity of the light passing through the oil and glasses, the color of soy-bean oils may be closely matched. It is also important that a uniform source of light be used with the Lovibond glasses and the 100-watt "Daylight Mazda" is recommended.

H. S. BAILEY

Notes on the titer of authentic samples of cottonseed oil. G. S. JAMIESON AND W. F. BAUGHMAN. *Cotton Oil Press* 4, No. 6, 48-9(1920).—A tabulation of the titers of the 41 authentic cottonseed oils (reported previously, *C. A.* 14, 3329). A comparison of these and the former results shows samples giving a low titer have a low content of satd. acids and that high titer is associated with high percentage of satd. acids. The max. titer reported is 32.2° C. and the min. 35.3° C.

H. S. BAILEY

The production of edible oils. ANON. *Chem. Age (New York)* 28, 342-7(1920).—"A description of the procedure and economics of the Baskerville process for the refining of edible oils." The chem. compn. of fats and oils and their objectional impurities is discussed. The necessity for, and methods of removing free fatty acids, and other impurities are enumerated and the undesirable features of the present NaOH refining process pointed out. The Baskerville process reduces the amt. of oil entrained in the "foots" and shortens the refining time. It differs from the old NaOH method in that 2% of prepd. cellulose is added to the oil before the caustic, and the lye used is stronger but less in amt. than in the present practice. Cuts of a perspective view,

cross section and flow sheet of a Baskerville plant are shown. Detailed estimates of profits in refining coconut oil, which are tabulated, indicate a net profit of \$40 to \$60 per ton.

H. S. BAILEY

The individual characteristics of some edible oils. A. A. POLLITT. *Chem. Age (London)* 3, 366-8(1920).—A digest of the data on source, production, uses, and methods of analysis found in works on fats and oils, for the following vegetable oils: linseed, cottonseed, olive, corn, almond, poppy, sesame, peanut, candlenut, sunflower and castor. No references more recent than 1917 are cited and a number of incorrect statements are made.

H. S. BAILEY

Vegetable tallow and stillingia oil. H. S. BAILEY. *Cotton Oil Press* 4, No. 7, 50(1920).—A quantity of seed from the *Stillingia sebifera* tree were obtained from So. Carolina, the tallow carefully scraped from the outer coat and the oil pressed and extd. with petroleum ether from the inner kernel. Statements in the literature to the effect that stillingia oil is poisonous were proved incorrect by feeding expts. with rabbits. The cold-pressed oil had the following consts.: I no. (Hanus) 158.7, sapon. no. 205.3, sol. acids as butyric 2.7%, insol. acids + unsapon. matter 91.2%, n_{25} 1.4812, neutralization value 182.1, mol. wt. 308.1.

H. S. BAILEY

The poppy, its cultivation and its utilization. O. LIEHR. *Landw. Ztg. (Fühlings)* 68, 191-8(1919).—Statistics show a great decline in production of oil-producing plants in Germany. The seeds contain about 45% oil. The poppy seed cake is widely used as fodder but must be cautiously used.

F. M. SCHERTZ

Avocado pears. ANON. *Bull. Imp. Inst.* 18, 129(1920); *Bull. Dept. Agr. Trinidad and Tobago* 18, 113(1919).—The amt. of oil contained in the Trinidad fruit is found to be only half that of the Californian fruit, viz., 23.7%, as compared with 46% expressed on the dry pulp. No explanation is offered.

R. L. SIBLEY

Application of super-centrifugal force. EUGENE E. AYRES, JR. *Chem. Met. Eng.* 23, 1025-6(1920).—See C. A. 14, 2099.

E. J. C.

Statement to the Color Committee (of A. O. C. S.) (PRIEST) 2. Fatty acids from mineral oils (Brit. pat. 148,358) 22.

UBBELOHDE, L.: *Chemie, Analyse und Technologie der Oele und Fette*. Leipzig: Verlag Hirzel. M. 96, bound M. 120.

Deodorizing oils. J. E. BOOGE. U. S. 1,357,836, Nov. 2. Oils such as cottonseed oil which have become partially oxidized and thus assumed an objectionable odor are improved by blowing with dry steam or other inert gas at a temp. of 105-130° (preferably about 120°).

Extracting oil from seeds, garbage, etc. R. WELLS. U. S. 1,357,365, Nov. 2. In extg. oil from seeds, garbage or similar material, the material is exposed in trays in a closed chamber to the action of a solvent such as CCl_4 or naphtha in which the material is immersed, and the temp. is raised to a point where the combined vapor tensions of the solvent and H_2O present are equal to or greater than the vapor pressure in the chamber, simultaneously to evap. solvent and H_2O , and solvent is added as required to maintain a const. vol. in the chamber.

Cleaning compositions. A. IMHAUSEN. Brit. 148,329, July 9, 1920. A compn. for washing clothes; and comprizing soap, an O carrier such as Na_2BO_3 , and benzene is characterized by the addition of NH_4Cl , or of Na or other alkali carbonate and an acid such as citric or tartaric, so that, when used with hot H_2O , NH_3 or CO_2 is liberated and the danger of fire or explosion reduced. In an example, citric or tartaric acid is encased in sugar, gelatin or H_2SiO_3 and mixed with soap or soap powder containing Na_2CO_3 ; and benzene is emulsified with H_2O , and encased in soap. The two composites are added

to cold H_2O in the tub, which is then heated. Both O and CO_2 are evolved from about 40° to 100° .

Cleaning compositions; hair washes. E. J. MARLBOROUGH. Brit. 149,111, June 16, 1919. A liquid detergent is prepd. by boiling for 2 hrs. say 6 lbs. of castile soap, or soft soap and petroleum, drying by slow heat, boiling in say 9 gals. of soft H_2O until dissolved, clarifying by adding about a tablespoonful of solid $Ca(OH)_2$, allowing to stand, and siphoning off the liquid, and adding say 8 oz. of saltpeter, 1 dram of saffron or other coloring, and a gal. of NH_4OH of, e. g., $1/8$ the strength of 0.880 NH_4OH . A hair wash is obtained by filtering the liquid through silver sand and adding spirit of lavender or other perfume.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Investigation on the existence of hydrated or anhydrous compounds of sucrose with certain salts. W. D. HELDERMAN. *Arch. Suikerind.* 28, 1701-14(1920).—The existence of such compds. has been tacitly assumed and used for the basis of certain molasses theories. H. has detd. the soly. curves at 30° of the 3-component systems containing sucrose, water, and one each of the following salts: K_2SO_4 , KCl , $NaCl$, $AcOK$, and $(COOK)_2$. The curves plainly show that no chem. compds. are formed. It was also definitely proven that the substance $C_{12}H_{22}O_{11} NaCl$ of Peligot (*Ann. Pharm.* 30, 71(1839)) is not a chem. compd. It was found, however, that solns. containing large amts. of sucrose and $AcOK$ are extremely viscous, exhibit the Tyndall effect, and dialyze very slowly. It is suggested that colloidal systems are involved here. F. W. ZERBAN

The invert method for the determination of sucrose. V. SÁZAVSKÝ. *Listy Cukrovar.* 38, 237-9, 245-7(1920).—The statement of Andrlík and Staněk (*Z. Zuckerind. Bohm.* 417, 1906-7), concerning the influence of optically active non-sugars upon the direct and invert polarization was confirmed experimentally. Further the mistaken opinion prevalent in the present technical literature about the unsuitability of tannin for use as a clarifying agent was completely disproven by the author's results. Tannin in conjunction with lead acetate was found to be a very energetic clarifying agent. Clarification with tannin was used with the greatest satisfaction under the most varied conditions in the detn. of invert polarization of various sugar juices. The usual method is questioned as to its accuracy and the methods of Saillard, Andrlík-Staněk and Staněk recommended for general use. JOHN M. KRUG

The determination of sucrose in the presence of both invert sugar and raffinose. WALLACE MONTGOMERY. *Intern. Sugar J.* 22, 580-2(1920).—First the "total sucrose" (sum of sucrose and invert sugar, figured as sucrose) and the raffinose are detd. according to Baumann's method (*Z. Ver. Zuckerind.* 48, 779(1898)). Then the invert sugar is detd. in the original sample by means of Fehling soln., the result multiplied by 0.95 and subtracted from the "total sucrose;" the difference is actual sucrose. Two tables are appended, for calcg. the factors F' and F'' in the Baumann formula, from the reduced Cu found. F. W. ZERBAN

Determination of sucrose in beet molasses by neutral double polarization. E. SAILLARD. *Louisiana Planter* 64, 285(1920).—Saillard shows that direct polarization in presence of HCl gives too low results, and that the inversion factor obtained on pure sucrose cannot be used on molasses, since the stronger acid used liberates weak organic acids which have less effect on the rotating power of invert sugar than HCl . A method is given for obtaining the true inversion factor, with allowances made for the effects of salts upon the polarimetric readings. C. H. CHRISTMAN

The working up of beets infected with a slimy decay. VI. STANĚK. *Listy Cukrovar.* 38, 133-5(1920); *Z. Zuckerind. cecoslov.* Rep. 44, 143-6(1920).—The cam-

paigu of 1918-19 was notable for its quantity of decayed beets. The infection caused the production of a slimy exudate in the beets. This slime was characterized by its solubility in water, insolubility in alcohol, rotation of polarized light to the left and its inability to reduce Fehling solution. The juice from such beets was very low in purity. In the working up of these beets no great difficulties were encountered in the diffusion batteries. Defecation with lime produced an abnormal ppt. which settled rather slowly and imperfectly. Most troubles were met with during carbonatation and the subsequent filtration. The sludge pptd. was very slimy and therefore difficult to filter. The lowering of the temp. on the diffusion batteries to 65°, and the use of Pšenička's method of saturation were the best means among others by the use of which a better filterable sludge was obtained. This procedure had to be accompanied by the additions of large amts. of lime. The light juice was abnormally colored and at times very hazy. During evaporation the juices frothed considerably. The heavy juices were almost always hazy and dark brown in color. Their purities ranged between 80 and 89. The lime content was 0.5-4.0% on the dry substance. The work on the centrifugals did not present any difficulties. The sugars produced contained from 1.1-2.6% of ash of which 0.2-0.5% was lime. The same difficulties, somewhat intensified, were encountered when working up the after-products. When the diffusion juice, especially from very badly decayed beets, could not be worked up for sugar products, it was usually acidified and then concentrated into a sirup for use in the distilleries. JOHN M. KRNO

The occurrence of saponin in dried exhausted beet cossettes. A. TRARGEL. *Inst. Zuckerind., Berlin. Z. Ver. Zuckerind.* 70, 449-50(1920).—The cossettes were extd. with abs. MeOH and the latter was distd. off. The residue obtained consisted of two layers, a dark brown, heavy, oily mass (A), and a light yellow, mobile liquid (B). A was extd. with ether to remove fat and wax, and the saponin was isolated from the aq. residue by sapon. with NaOH and pptn. with HCl. The saponin can also be salted out directly with $(\text{NH}_4)_2\text{SO}_4$. B, treated in the same manner as A, also yielded saponin. The latter could not be purified sufficiently for analysis, but was identified by the characteristic foam formation, by the color reaction with H_2SO_4 by the green color obtained with Fehling soln., and by the strong hemolytic effect. F. W. ZERBAN

Working up low products. A. GRILL. *Z. Ver. Zuckerind.* 70, 459-68(1920).—Attention is called to the often overlooked fact that the temp. at which the low products are cured in the centrifugals must be considered in detg. the amt. of water to be added to the crystallizer fillmass. Tables are given, from which the proper quantity of water to be added can be found, for sirups of varying compn. and for different temps. of centrifuging. It is not necessary to add the water in a number of small doses, but it can generally be divided into about 3 or 4 portions, each corresponding to a temp. decrease of about 12°. F. W. ZERBAN

Dry distillation of exhausted cossettes. W. PARR AND A. STARKER. *Z. Ver. Zuckerind.* 70, 445-9(1920).—The purpose of this investigation was to find an explanation for the explosions sometimes occurring in cossette-drying plants, by examg. the products formed upon heating the cossettes. Low-temp. distns. could not be made, on account of frequent interruptions in the gas and elec. service. Upon dry distn. at 500-600°, 200 g. cossettes yielded 100 g. liquid distillate (with 9 g. AcOH and 14 g. tar), 60 g. charcoal, and 29-32 l. gas. The gas obtained in the first half (14 l.) and the last half (17.5 l.) of the distn. contained, resp., 53.2 and 30% CO_2 , 9.6 and 1.4% O, 15.8 and 15.2% CO, 13.8 and 21.7% CH_4 , 5.9 and 1.78% H, 9.3 and 11.9% N, 1.4 and 2% heavy hydrocarbons. The gas formed explosive mixts. with O and air. F. W. Z.

An improved method of measuring color in the sugar factory. A. E. BAWTREE. *Intern. Sugar J.* 22, 556-7(1920).—The instrument constructed for this purpose consists of a rectangular box divided longitudinally into 2 compartments. White light passes through both of these, on the one side through a calibrated shutter, and on the

other through 3 screens, scarlet, green and violet, each one also provided with a calibrated shutter. The light from both compartments is projected to an ocular opening through which the 2 beams can be directly compared with each other and equalized in tint and intensity. The liquid, the color of which is to be measured is placed in a glass trough in the white-light compartment and its color is measured by manipulating the shutters over the color screens. The readings on the shutters are a measure of the color of the liquid in terms of the 3 primary colors. Opaque objects can also be read by reflected light.

F. W. ZERBAN

A new decolorizer for sugar juices. E. SAILLARD. *Circ. hebdom.* 435, 1919; *Cukrovar. Listy* 38, 261(1920).—The decolorizer acted more effectively though slower than "blankit" and other sulfurous decolorizers. Analysis showed the composition essentially to be 50% of sodium bisulfite, 25% Na_2SO_4 , and 25% of water and impurities. On standing a white ppt. tended to separate from the paste. Above this sediment was a zone of yellow-colored soln. On mixing it became a semi-fluid white paste, completely soluble in water. It reacted acid to phenolphthalein and weakly basic to methyl orange. 100 cc. of a soln. of 100 g. of molasses in a liter of water, having a colorimeter reading of 100 units, treated with 0.1 g. of the paste gave a reading of 76. The use of 1 g. reduced the color to 55. Larger quantities failed to decolorize the soln. any further. One objection to its use is that it introduces a large amt. of sol. sodium salts into the sugar juices.

JOHN M. KRUG

Boneblack and decolorizing carbons. W. D. HORNE. *Facts About Sugar* 11, 372-375(1920).—A general discussion of the properties desirable for satisfactory boneblack, removal of color, final removal of impurities, substitutes for boneblack, difference in effect of absorbents, and results with different colors. Cf. *C. A.*, 14, 3782.

N. KOPELOFF

The relation of the amount of lime used in connection with carbonation and the invert sugar content to the purity and lime content of the light juices. VL. STANEK. *Cukrovar. Listy* 38, 313-5(1920).—In the first series of expts. the juices were clarified with a const. amt. of lime, the invert content being varied by the addition of diff. amts. of invert sirup of known invert content. The juices were subjected to double carbonation. The results indicated that during carbonation of the juices the increase in the amt. of invert present caused a decrease in the purity and an increase in the content of org. Ca salts. To obtain the pptn. of the largest amts. of org. Ca salts careful and well regulated carbonation must be carried out. The increase in the amt. of lime entering the soln. with the increasing invert content, was due to the pptn. of some of the org. acid salts by the freshly formed CaCO_3 . A second series of expts. was undertaken in which juices, having a const. % of invert but a varying amt. of lime, were carbonated. Essentially the same procedure was followed as for the first series except that together with the double carbonation, some of the juice was subjected to a third carbonation after the addition of a quantity of lime at the 2nd saturation. The results showed that the purity increased and the lime content of the juice decreased with the increasing amts. of lime used. The 3rd carbonation under the addition of the lime at the 2nd saturation, increased the purity and decreased the final lime content. This effect is more pronounced, the less lime is used at the 1st saturation. As in the first set of expts., the effect of the so-called physical clarification of the juice by the freshly pptd. CaCO_3 was shown.

JOHN M. KRUG

The sugar and alcohol industries in the devastated regions. MAURICE PELLET. *Bull. assoc. chim. suc. dist.* 38, 29-46(1920).—Statistics mostly. Five or ten years will be necessary for the restoration of the industry.

I. D. GARARD

Kinds of sugar and how made in the Philippines. C. W. HINES. *Louisiana Planter* 64, 238-9(1920).—A short history is given indicating the origin of various systems of sugar manuf. used. The production of Pilon, Caramelo, Panocha, Bayong

and centrifugal sugar are discussed. Production statistics for 1913-19 are given.

C. H. CHRISTMAN

The sugar production in Cuba for the 1919-20 crop. ANON. *Intern. Sugar J.* 22, 437-8(1920).—Statistical data, including a table showing the chem. control figures for 45 factories.

F. W. ZERBAN

Chemical control results obtained in Hawaii for the 1919 season. E. T. WESTLEY. *Sugar Central and Planters' News* 1, No. 9, 1-4(1920); *Intern. Sugar J.* 22, 471-2(1920).—The extn. obtained has been better than ever before, one factory recording 99.05 for the entire season. These good results are partly due to the slow rate of grinding. Another important factor is the fiber content of the cane, as it is the fiber which is actually ground. The loss of sucrose in press cake has been reduced, although the total quantity of mud has increased, owing to the greater comminution of the bagasse. In order to do good work, the mud must be alk. and must be kept hot throughout. The pressure should not go above 20 lbs., and the presses must be filled as quickly as possible. The loss of sucrose in molasses is being steadily reduced, by boiling the last massecuite very stiff and on an even grain. The undetd. losses have also been cut down. The highest efficiency of any one factory for an entire season has been 96.71%, on the basis of 100% for getting 100% extn., a molasses of 30 gravity purity, and having no other losses. The good work done in Hawaii is largely due to active coöperation among the different factories.

F. W. ZERBAN

Manufacture of "whole-juice sugar" (sucre complet). ANON. *Intern. Sugar J.* 22, 440-1(1920).—A review of articles previously noted (*C. A.* 14, 2101). F. W. Z.

The composition of filter press cake, and improved methods for sweetening off. ASKAN MÜLLER. *Deut. Zuckerind.* 45, 571-2(1920).—The use of plunger- and similar pumps causes the heavier particles of the mud to settle in the bottom of the filter press frames and also necessitates heavy filter cloths on account of the constant pressure fluctuations. The wash water passes readily through the porous bottom layer and fails to act on the finely divided mud in the top. Much water and time is therefore required to sweeten off. Centrifugal pumps correct this trouble, but their upkeep is expensive. Kelly presses give good results, because here the heavier particles accumulate below the filter frames. The same effect may be attained in plate and frame presses by somehow obstructing the passage of the wash water in the lower part of the frames; this may be done by making the canals in the plates smaller, by fastening a piece of heavy cloth on the lower part of the filter cloth, or by similar methods. Another remedy consists in placing in the pipe line an air cushion which acts as a shock absorber. F. W. Z.

Colloidal water in cane. B. A. DE RUITER. *Arch. Suikerind.* 28, 1587-9(1920).—During the years 1915-9 the control figures for colloidal water at Djatiwangi, Java, were always low, and sometimes negative. This was not due to faulty methods of analysis, but to the fact that the campaign was always started late and that part of the cane was never ground until several days after being cut. In cut cane the colloidal water disappears quickly by drying out, and the same happens in standing cane during the dry season. At the beginning of the 1920 campaign, when young cane was ground soon after cutting, the colloidal water was perfectly normal in quantity, but diminished again later on, just as had happened in former years.

F. W. ZERBAN

Colloidal water in cane. F. R. BÖNTLINGK. *Arch. Suikerind.* 28, 1663-4(1920); cf. preceding abstract. B. agrees with de R. that the colloidal water in old cane is apt to be low, but calls attention to the fact that low and even negative figures may readily be obtained in the analysis of the bagasse if the latter is not comminuted sufficiently.

F. W. ZERBAN

Normal solutions—discussion, preparation, standardization. WALLACE MONTGOMERY. *Louisiana Planter* 65, 255(1920).—A table of normal wts. of chemicals used by the sugar chemist is given. Prepn. of approx. normal solns. and their diln. to exactly

normal solns. is discussed. Formulas for dilg. strong solns. and strengthening weak solns. are given.

C. H. CHRISTMAN

The manufacture of table sirup. C. W. HINES. *Louisiana Planter* 64, 252-4 (1920).—The production of cane sirup is discussed, attention being directed toward sulfuring, settling, clarification and evapn. Compn. of sorghum juices and prepn. of sirup are given. Maple sirup, palm sirup, and glucose sirup from starch and by acid inversion of sucrose are discussed.

C. H. CHRISTMAN

A new system of cane juice clarification. I. H. MORSE. *Louisiana Planter* 65, 301-2, 315-7(1920).—A cold clarification system is described. Juice after sulfuring and liming is run through a battery of 3 tanks holding about 3000 gallons each or a total of 45 min. run. Juice enters near the bottom and overflows at the top into the next tank. Each tank is provided with a small auxiliary tank at the center and below the tank bottom. This serves as a mud collector and drains into a mud tank from which the mud is pumped to filter presses. The ppt. in the juice is carried into the center of the tank and then into the mud collector, by circular motion of the juice. This is induced by a cone placed above the center of the tank and rotated by a motor above the tank. The juice freed from pptd. matter flows into the juice heater charge tank. This system removes the dirt of the mill juice, the sulfur ppt. and the lime ppt. without any decompn. of the glucose present, gives thorough mixing and produces a juice brilliant and clear. The resulting sugar and molasses are purer. Over- and under-liming are equalized more easily in this system.

C. H. CHRISTMAN

The development of crystallization in motion. EDMUND O. VON LIPPMANN. *Deut. Zuckerind.* 45, 443(1920).—Historical.

F. W. ZERBAN

Review of the most important articles in the field of pure sugar chemistry published during the first six months of 1920. EDMUND O. VON LIPPMANN. *Deut. Zuckerind.* 45, 404, 419, 431-2, 456(1920).

F. W. ZERBAN

Ammonia and the amines obtained by the dry distillation of vinasse (LAJBL) 18.

NEUMANN, P.: *Zucker und Zuckerwaren, mit Einschluss von Stärkezucker und Stärkesyrup.* Leipzig: Akad. Verl. Ges. 154 pp. For review see *Deut. Zuckerind.* 45, 542(1920).

SCHALLEHN, C. ARTUR: *Zabel's Jahr- und Adressbuch der Zuckerfabriken. Betriebszeit 1920-21.* 50th year. Magdeburg: Verlagsanstalt f. Zuckerindustrie. M. 25. For review see *Deut. Zuckerind.* 45, 524(1920).

29—LEATHER AND GLUE

ALLEN ROGERS

Synthesis of tanning materials. GEORG GRASSER. *Collegium* 1920, 234-55.—G. defines tanning materials as water-sol. plant products which display certain chem. reactions, possess astringent properties, and are able to convert animal hide into leather. Substances which possess reactions similar to those of tanning materials, have astringent properties, but do not convert hide into leather, are designated as tannin-like substances. He discusses the so-called synthetic tanning materials. From a description of the individual properties of the different condensation products, it is seen that the ability to ppt. gelatin and to be absorbed by hide powder, does not imply an unconditional ability to act upon raw hide. Hydroxynaphthylmethanesulfonic acid ppts. gelatin, but has no influence upon raw hide; Na dicresylmethanedisulfonate, on the contrary, does not ppt. gelatin, does not tan raw hide, but is absorbed by hide powder as a "tanning substance." *o*-Nitrophenol does not ppt. gelatin, but is somewhat absorbed by hide powder, and tans raw hide to some extent. Concerning the synthesis of condensa-

tion products possessing tanning properties, the following can be stated: All phenols can be turned through condensation into true tanning materials, either as a result of the condensation directly, or after turning them into sol. sulfonic acids. The alk. soln. of phenols is also subject to condensation by dehydrating means. The product thus obtained yields, after acidification, a water-sol. tanning substance. Same can be accomplished through the application of aldehydes. The thio-, chloro-, bromo-, nitro- and amino-derivs. of phenol yield tanning materials of similar properties. The quinones as such possess tanning properties. The aromatic dialcohols undergo condensation with different sulfonic acids and yield highly valuable tanning substances. Those of the aromatic acids which form water-sol. products on sulfonation seem to yield noteworthy tanning materials after condensation; where this is not the case, the water-sol. alk. salts can be condensed with aldehyde. Those of the condensation products which show no insol. pptn. after neutralization or slight acidification, possess tanning properties. The diphenyl derivs. show manifold tanning properties under the above-mentioned conditions. The method of condensation generally is of no special significance. The splitting of water through ordinary heating is successful only occasionally, since the temp. required to bring about this reaction in many cases causes the decompn. of the substance. Such decompn. is brought about in some cases incidentally through a reduction of the pressure. Condensation with HCHO is generally successful, and with AcOH and benzaldehyde only occasionally. Other water-splitting agents generally bring about condensation easily, but the presence of secondary products gives to the final substance and to the resulting leather a very unfavorable color.

B. S. LEVINE

Laboratory wearing test to determine the relative wear resistance of sole leather at different depths throughout the thickness of a hide. REEVES W. HARR. *Bur. of Standards, Tech. Paper No. 166*, 7 pp. (1920).—Preliminary tests of the wear resistance of leather at different depths through the hide were made on 18 samples of sole leather cut from the same hide. The 18 samples were divided into six groups, three of these with the grain side out and 3 with the flesh side out, and were subjected to wearing machine tests. The 3 groups worn with the grain side out were subdivided so that (A) was of original thickness; (B) skived to $\frac{2}{3}$ its original thickness, and (C) skived to $\frac{1}{2}$ of its original thickness. The 3 groups worn flesh side out were subdivided in the same way. The relative wear resistance was measured by loss in wt. and shown in graphs. The av. of these results shows that the grain and flesh sides wear away faster than the interior portions and that the flesh wears away somewhat faster than the grain. [Abstractor's Note.—In considering the results of these tests it must be borne in mind that a difference in density of the different layers may change the order of these results considerably and also that leather is subject to changes in wt. due to changes in temp. and humidity and unless all weighings are made after the leather has come to const. weight under standard temperature and humidity conditions, errors may be introduced.]

J. S. ROGERS

The determination of hydrochloric acid and neutral chlorides in leather. ARTHUR W. THOMAS AND ALEX. FRIEDEN. *J. Ind. Eng. Chem.* 12, 1186-8 (1920).—This is an extension of the Thomas method for detg. H_2SO_4 in leather (cf. *C. A.* 14, 2102). Total chloride is extd. by digesting 1 g. leather for 2 hrs. with 200 cc. hot 0.1 *M* NaH_2PO_4 . Neutral chlorides are extd. by digesting 1 g. leather for 2 hrs. with 200 cc. 95% alc. at 75°. In both cases the chlorides are detd. by pptg. and weighing as AgCl. The HCl is calcd. by difference.

J. A. WILSON

Nature of the hide-tannin compound and its bearing upon tannin analysis. JOHN ARTHUR WILSON AND ERWIN J. KERN. *J. Ind. Eng. Chem.* 12, 1149-52 (1920).—Tannin once combined with hide cannot be removed to an appreciable extent by any amt. of washing that would be practical. When a tan liquor is boiled, evapd., or O is passed through it, some of the non-tannins are converted into substances capable of

tanning. This change can be followed by the authors' new method of tannin analysis, but not by the A. L. C. A. official method. The new method gives results which agree closely with tanning practice, but the A. L. C. A. method is greatly in error. It is recommended that the new method be adopted as a standard. J. A. WILSON

What do we really determine as vegetable tanning matter? E. SCHELL. *Le Cuir* 9, 491-3(1920); *J. Am. Leather Chem. Assoc.* 15, 669-72(1920).—This is a criticism of the Wilson-Kern Method of tannin analysis (cf. *C. A.* 14, 2103). S. finds it hard to believe that the official methods of Europe and America really can be in error to the extent of from 43 to 220% as stated by W. and K. S. insists that there are two kinds of tannin corresponding to quinone and hydroquinol, the latter being capable of forming a stable compd. with hide only after oxidation, and that the Wilson-Kern Method gives only the quinone-like tannin. A translator's note (by the present abstractor) points out that the substances which S. likens to hydroquinol are not tannins, even though they may be converted into tannins by oxidation (see preceding abstract). J. A. W.

Magnesium sulfate in vegetable tanned leathers and its effect upon analytic results. E. JALADE. *Le Cuir* 9, 467-71, 484-6(1920); *J. Am. Leather Chem. Assoc.* 15, 674(1920).—The presence in leather of more than 1% of Epsom salt must be considered fraudulent. Special precautions are required in analyzing leathers containing much magnesium sulfate because of reduction of some of the sulfate and the retention of a portion of the water of crystn. when detg. ash and moisture, resp. These errors can be avoided by calg. total MgO to $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$. J. A. WILSON

The jelly strength of gelatins and glues—correction. S. E. SHEPPARD, S. S. SWERT AND J. W. SCOTT, JR. *J. Ind. Eng. Chem.* 12, 1214(1920); cf. *C. A.* 14, 3818. E. J. C.

The analysis of sulfonated oils (ANON.) 27. Wilmington and chemical industry (glazed kid leather) 13.

Drying varnished ("patent") leather. H. SCHULZ. U. S. 1,353,937, Sept. 28. The material to be dried is subjected to the simultaneous action of ultraviolet rays and hydrazine, N or other deriv. formed from NH_3 .

Synthetic tanning agents. CHEMISCHE FABRIKEN WORMS AKT.-GES. (formerly Chemische Fabriken & Asphalt-Werke Akt.-Ges.). Brit. 148,126, July 9, 1920. Synthetic tanning agents are prepd. by coupling by means of an appropriate atom or group two different aromatic compds., one of which is capable of coupling with diazo compds., while the other is not, and solubilizing the product by introducing acid groups during or after the coupling. According to examples: Phenol is heated with H_2SO_4 , then naphthalenesulfonic acid and P_2O_5 are added and the mixt. heated further; cresol is sulfonated by H_2SO_4 , anthracene-2-sulfonic acid is added, and then S_2Cl_2 , and the mixt. heated; S_2Cl_2 is added to a mixt. of phenol and naphthalene sulfonic acid and the mass heated with H_2SO_4 ; a mixt. of Na phenol-*p*-sulfonate and Na 1-naphthylamine-6-sulfonate is heated with HCHO soln. The products are worked up by dissolving in H_2O , filtering, and partially neutralizing with alkali. Other condensing or coupling agents may be used, or other agents for introducing acid groups, such as chlorosulfonic acid, Na sulfite or bisulfite or HCHO bisulfite. The products may be used in tanning either alone or mixed with vegetable or mineral tanning agents.

Tanning. O. RÖHM. Brit. 147,797, July 9, 1920. Skins are tanned by an Fe salt soln., such as FeCl_3 , to which a dil. soln. of water glass is added, any deposit of $\text{Fe}_2(\text{SiO}_3)_3$ formed at the beginning of the process being re-dissolved by stirring. The skin may be placed in the Fe-salt soln., and after this has penetrated the pores the desired quantity of soln. of water glass is slowly added. The action is improved by the addition of HCHO or other aldehydes to the bath at any desired stage; or the skins may be pickled or treated with HCHO before commencement of the process. In an example 180 kg. of skins are treated in a clear soln. of $\text{Fe}_2(\text{SiO}_3)_3$ prepd. by adding 200-300 kg.

of a 10% soln. of concd. water glass to a soln. of 10 kg. of FeCl_3 in 100 l. of H_2O . 5 kg. of NaOH may be added to the ferric soln. 2-3 kg. of HCHO may also be added.

Tanning furs. T. O. WILLIAMS. U. S. 1,355,374, Oct. 12. In tanning rabbit or squirrel skins or similar furs, the skin side is cleansed with a dil. soln. of ext. of poke root until the hide is thoroughly moistened, then after the skin has partially dried but while it is still slightly moist kerosene is applied to the skin side to neutralize the toughening action of the poke root and render the skin soft and pliable. The skin is then dried and washed with gasoline to remove glue and other foreign matter.

Shoe-stiffening fabric. J. L. McCLELLAN. U. S. 1,353,968, Sept. 28. The fabric is impregnated with a filler of copal 6 lbs., colophony 4 lbs., kino 2 lbs., celluloid 2 lbs., alc. 3 gals. and EtOAc $\frac{1}{2}$ gal.

Leather. J. J. SROECKLY. Brit. 148,454, July 10, 1920. Enameled or patent leather is hardened during the drying process, either under the action of heat or of ultra-violet rays, or of a combination of these processes, by submitting the varnished surface to the action of alcs. in liquid or vaporized state. Ethyl, methyl, propyl, butyl, amyl, or other alcs. may be used. A better result is obtained by causing alkalies, such as K, Na, or NH_4 hydroxides dissolved in alc. or other suitable medium, to act on the patent leather. The drying process is stated to be accelerated by these means.

Tanning, etc. J. MOREL. Brit. 148,615, Apr. 22, 1919. Basic Cr sulfate $(\text{Cr}_2(\text{SO}_4)_2(\text{OH})_2)$ for tanning, dyeing, printing, dressings, etc., is produced by bringing SO_2 in the gaseous state in contact with an alk. dichromate or a neutral chromate without addition of H_2SO_4 or other reagent. The SO_2 is formed by the combustion of S or of pyrites, and the dichromate or chromate is in soln. or in contact with H_2O . Cf. 3,385, 189r.

Synthetic tanning agents. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 148,897, July 10, 1920. Addition to 148,126 (cf. following abst.). Synthetic tanning agents are prepd. (1) by coupling aromatic compds. containing acid groups with vegetable tanning agents; (2) by coupling water-sol. aliphatic compds. with vegetable tanning agents. According to examples: A mixt. of phenolsulfonic acid and tannin is heated with HCHO soln., a mixt. of Ba cresolsulfonate and tannin is heated with HCHO soln. and the product acidified, a mixt. of naphthalene and phenol is heated with H_2SO_4 , the product is condensed with HCHO, and the resulting tanning agent further heated with tannin and HCHO soln., coal-tar phenols of b. p. 185-200° are heated with Na_2SO_3 and HCHO soln., then quebracho ext. and HCHO soln. are added and the mixt. further heated, a mixt. of glucose and tannin is heated with HCHO soln. The products may be used in tanning alone or mixed with other tanning agents or in combined tanning processes, using both vegetable and mineral tanning agents.

Synthetic tanning agents. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 148,898, July 10, 1920. Addition to 148,126 (cf. preceding abst.). Synthetic tanning agents are obtained (1) by coupling by means of appropriate atoms or groups aromatic hydroxy compds. or their metal salts with aliphatic hydroxy compds.; (2) by similarly coupling aromatic compds. free from hydroxy groups with aliphatic hydroxy compds.; (3) by repeated coupling of aromatic compds. by means of aldehydes, P_2O_5 , etc., to obtain products of high mol. wt. and introducing acid groups to solubilize them. Numerous examples are given.

Synthetic tanning agents. GERB- UND FARBSTOFFWERKE H. RENNER & Co., Akt.-Ges. Brit. 148,750, June 26, 1920. Synthetic tanning agents are prepd. from coumarone resin by the following processes: (1) A mixt. of coumarone resin with a mono- or polyhydric phenol is sulfonated, with or without the addition of HCHO; (2) a sulfonated coumarone resin is condensed with the resins obtained by alk. condensation of phenols with HCHO, or a non-sulfonated coumarone resin is condensed with the sulfonated phenol-HCHO resins; (3) the coumarone resins or their sulfonic acids

are condensed with aromatic or "heterocyclic" hydrocarbons, or their sulfonic acids, or with the acid resins from mineral or tar oil purification, or with the products described in 146,166 (C. A. 14, 3545); (4) coumarone resins which contain also indene are condensed and sulfonated by means of H_2SO_4 , with or without $HCHO$; (5) the sulfonated or non-sulfonated product of (4) is further condensed and sulfonated, together with phenols, with or without $HCHO$ or with the products of (1), (2) or (3); (6) the products of the foregoing processes are converted into quinone-like compds. by oxidation, e. g., by means of ozone, H_2O_2 , K dichromate or permanganate, or persulfates. Examples are given.

Crayon for marking hides. A. E. SCHMIDT. U. S. 1,357,594, Nov. 2. A crayon or pencil for marking the surface of tanned hides is formed of $FeSO_4$, starch, glue, glucose, plaster of Paris and H_2O .

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

The effect of compounding ingredients on the physical properties of rubber. C. OLIN NORTH. *India Rubber World* 63, 98-102(1920).—The physical properties studied were tensile strength, elongation, permanent set and tensile product. Instead of figuring the tensile strength on the area at rest, N. figures it at break, using the formula $T' = (T \times d')/d$, where T is the load at break, d the initial distance and d' the final distance between the two marks on the test piece. This assumes that the vol. remains const. and while this is not exact, the error introduced is small. Barytes, tripoli, lithopone, $MgCO_3$, ZnO , and gas black were studied, and the effect varied in this order, barytes showing the least increase in tensile strength and the least decrease in ultimate elongation, whereas gas black showed the highest values. N. also calculates the corrected tensile strength at break by dividing the tensile strength by the volume of rubber, and multiplying by 100. When plotted, the figures for barytes form a straight line; lithopone and tripoli rise up to 5 vols. and then fall away; $MgCO_3$ rises up to 15 vols. and then falls away rapidly; ZnO rises to 11 vols., remains const. up to 35 vols. beyond which there is a decrease; gas black rises slowly up to 35 vols. and remains const. up to 50 vols., the highest amt. tested. N. explains the change in physical properties by assuming that vulcanized rubber contains a network of fine fibers and that when the interstices are occupied by fillers, the latter act as struts, to prevent the movement of fibers, and thus decrease the elongation and increase the tensile strength. J. B. T.

War department specifications for mechanical rubber goods. II. ANON. *India Rubber World* 52, 649-51(1920). J. B. T.

MARZARN, RICHARD: *Materialienkunde für den Kautschuk-Techniker. Ein Hand- und Nachschlagebuch.* 2nd Ed. revized and enlarged. Berlin: Union Deutsche Verlagsgesellschaft, Zweigniederlassung, Berlin. M. 60. For review see *Gummi-Ztg.* 35, 88(1920).

WHITBY, G. STAFFORD: *Plantation Rubber and the Testing of Rubber.* London: Longmans, Green & Co. 559 pp. 28s.

Leather substitutes. A. KORN. Brit. 147,910, July 9, 1920. Waste rubber and canvas tube and tire covers are washed, surplus rubber being removed if necessary, placed in H_2O at 100° , flattened, boiled in H_2O , elongated by stretching, and vulcanized. The flat bands thus obtained are then pressed and may be colored and varnished. The product is used as a substitute for leather.

Vulcanizing rubber. W. SCOTT. U. S. 1,356,495, Oct. 19. Acceleration of vulcanization of rubber is effected by the use of di-*o*-tolylthiourea or a similar compd.

Neutralizing acids in vulcanized rubber. W. E. MUNTZ. U. S. 1,354,123, Sept.

28. Oxy-S acids and anhydrides generated in rubber during vulcanization are neutralized by heating the material and treating it with NH_3 under pressure.

